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VOL. XIV. NEW YORK, NOV. 16, 1889. No. 20.

The New York World's Fair. Now that the objections to the use of Central Park for the World's Fair have been wisely yielded to, there should be no great trouble in completing the $5,000,000 guarantee fund. The movement should win the favor and support of all, and the $2,500,000 already solidly pledged should be quickly doubled. Mr. Edison's subscription for $5,000 is an earnest of the interest taken in electrical circles, and his example deserves to be generally followed.

Elihu Thomson's Decoration. It is with much pleasure that we note the appreciation shown of our distinguished countryman, Prof. Elihu Thomson, by the French Government. Our readers are already aware that the Thomson-Houston exhibit was awarded a Grand Prize by the Exposition Jury. The government has now made Professor Thomson an Officer of the Legion of Honor, and in conferring this decoration has certainly honored itself as well as the recipient.

Northwestern Electrical Development. Last week we gave some very interesting information in regard to the rapid electrical development of the Northwest. A new region like that, rich in water powers and minerals, and full of shrewd, enterprising men, offers an excellent field for electrical applications, and, as our report showed, the opportunity has not been neglected. Even disasters help to make a way for the new ideas and appliances. Thus at Seattle, where, as was stated, land was more valuable after the recent great fire than before, a notable demand has sprung up for electric motors. There were a number of small, isolated steam plants in operation, but now on resuming work the owners give a decided preference to the motor. This is natural on their part. They are relieved from fuss and worry as to their power, obtain a lower rate of insurance. and can switch the current on and off at the instant.

Recording Motor Operation. Where the work performed by an electric motor, or indeed any electric device, is supposed to be practically constant during the entire run, a simple device to record merely the time of operation is of value as a basis upon which charge can be made. An ingenious little device of this kind is that due to Mr. Spaulding, which is illustrated elsewhere in our columns, and in which the magnetic state of the pole piece is neatly made the medium for the running or stopping of a registering clock movement placed close to the pole.

Novel Applications of Electricity. A Western inventor is endeavoring to interest capital in his electrical magic lantern for casting or reflecting advertisements on the dark clouds that often hang low over a city. The inventor claims to have secured contracts from several well-known firms for displaying their cards in this manner, and we may shortly expect to see reflected on the overhanging clouds the advice, in gigantic letters of gold, "Buy Stock in Ketcham & Cheatham's Primary Battery Lighting Company." A recent affair of some local importance in a Western town developed the fact that a young woman had purchased a four-light chandelier specially designed to contain a detective camera arranged to be operated by the closing of an electric circuit, concealed pushes or circuit closers being placed at convenient points, while a miniature reflector directed a portion of the rays of light from one gas jet directly on the plate. The apparatus worked to perfection on the fourth evening that the victim, a wealthy old gentleman, called on the young woman!

Postmasters in Conference. Some intimation of what is coming was given by Postmaster-General Wanamaker at his conference, in Washington last week, with the postmasters of some of the larger cities, when he notified those officials that he will recommend in his report the establishment of some sort of postal telegraphs in connection with the post office department. He is of opinion, he told them, that the time for such a movement has come, and he will urge it strongly, leaving the details to Congress. Mr. Wanamaker has evidently been steering in this direction, and the announcement is not a great surprise. It is not easy to understand why he should want to confer with local postmasters on the matter, unless his scheme is of the limited character already made known, whereby the postmen are to collect and deliver telegrams. About the telegraph business itself, the postmasters know as much as Mr. Wanamaker, and that is nothing; so that their advice, valuable as to postal affairs, could not avail him very much as to telegraphs, however favorable they might be toward any aggrandizement or magnification of their office.

Monopoly or Pantopoly. An interesting article is published in the *Statesman* from Mr. James Lane Allen, in which it is argued that the telegraph should be a "pantopoly" instead of a monopoly, the word meaning a government ownership and control on behalf of the nation. We do not know that the idea becomes more acceptable from having a new name given it, and as we have before argued, the reasoning that is applied by Mr. Allen and all like him to national telegraphs would apply just as well to any other industrial agency or material property. Every one will admit with Mr. Allen that the telegraph and the railroad have been great benefactors and civilizers, but so have the printing offices and the cotton mills, the steamship lines and the street railways. It does not follow that because a thing is good the government has the right to spoil it. The day may come when the whole nation, with all its industries, will constitute a "civil service" with "reform" rules, and an ironclad scale of promotion and pay, but it will not be the enterprising, persevering, inventive American nation of the present year of grace.

Long-Distance Power Transmission. The utilization of the natural forces furnished by waterfalls is every day becoming more the subject of study, and some work in this direction has already been done, though much still remains. The feasibility of transmitting power considerable distances is evidently one which must largely involve the factor of cost; but once this is determined, the question of the electrical methods to be applied is next in order. In considering this problem, Mr. Lemuel W. Serrell takes up the question of the nature of the generators to be employed in a long-distance power transmission, and shows that for obtaining the best results at the motor end as to speed and constancy of potential, the generators should be over-com pounded, and he indicates the way in which the amount of over-compounding may be determined. Always practical in his articles, Mr. Serrell also goes into the question of the cost of such an installation, and he shows what the expense attached to the construction of an installation of this kind would amount to. As a guide for similar work of this character, to those interested in this branch of electrical application, Mr. Serrell's article will prove most welcome.

Light in New York Streets. Gradually the local arc light companies are resuming their work, interrupted a few weeks ago by the actions of the Board of Electrical Control. The following paragraph from a daily contemporary is not bad: "Shelley remarked that 'Hell is a city like London.' He had never been in New York when the electric lights went out." The carnival of crime that followed the extinction of the arc lights was one of the worst experiences this city has had, and the temporary renewal of the gas lamps in various districts only went to show that the day of gas as a satisfactory street illuminant has gone by. City Hall Square now, with all its gas lamps, is one of the gloomiest spots in the city.

Novel Transformer Regulation. In the design of prime movers or sources of power, whether it be the dynamo, the steam engine or the gas engine, the proportion of the parts and details of construction must, for the sake of safety, be calculated for the maximum strains that may be put upon the machine, and, indeed, they are, as a rule, calculated on the basis of being operated at their maximum capacity. The result of this is that in almost every case of such machines their efficiency is reduced when operated at loads below the maximum, the dynamo and electric motor being in this respect probably the most economical. The rule cited above is also true of the secondary generator or alternate current transformer. Though recognized as a defect, this property of the converter does not seem to have attracted the attention on the part of inventors which its importance would merit. It is interesting to note therefore that the design of the converter of Dr. Paget, illustrated on another page, contemplates its operation at a uniformly high efficiency at all loads. This is accomplished by altering the resistance of the magnetic circuit to a proportional amount. In some respects the method of Dr. Paget bears an analogy to the method of construction advocated by Mr. James Swinburne, of London, who claims by employing an open magnetic circuit to overcome some of the objections now met with.

State Electric Light Associations. We give elsewhere in our columns this week, through the courtesy of Mr. A. R. Foote, the details of the work done in Boston last week in founding the first of the State Electric Light Associations, namely, that for Massachusetts. This movement has slowly been taking shape and gathering strength, and now promises to lead on to very important results. Some two or three years ago it was suggested in these columns that such organizations could do service and would be found necessary, and now that the electric light and power industry has taken on vast proportions everywhere, the material for membership is abundant. There are perhaps a few States where associations may not yet be required, but in those instances it will be easy enough to band together in bodies with extra-State boundaries. It is to be noted that the National Electric Light Association is fostering this work. This is right. The Association can help the local bodies, and they in turn can assist in giving weight, influence and dignity to the national body itself, which, after all, will be practically but an aggregation of State associations. It is early yet to discuss the scheme with full comprehension of its possibilities, advantages and dangers, but it certainly deserves support and encouragement as a means for protecting and advancing the commercial and industrial interests of electric light and power. The next thing is to see other States fall in line.

Tempora Mutantur When the alternating current system of distribution made its appearance and asked for its share of recognition as a practical development in the field of applied electricity, there were many who predicted its failure and paid no particular attention to this branch of the subject. The success which the system soon achieved, however, forced the majority of the skeptics to change their views, and with but few exceptions the alternating current has now become recognized as a valuable addition to the other well-known and tried methods. The appearance in our columns, therefore, of a description of a converter system would, ordinarily, call for no special comment at this late day, but we cannot refrain from directing attention to the article on another page describing the converter recently brought out by Siemens & Halske, of Berlin. Among those whose opinion was entitled to weight, and who refused to recognize the alternating system as a practical method of distribution, were Siemens & Halske. To their studied neglect of the system may probably be traced the paucity of alternating current apparatus in Germany. The present undertaking of the manufacture of alternating current apparatus by that well-known firm would indicate that their opinion of the merits of the system has changed, and that they look upon it as a desirable addition to their lines of work. It might be argued by some, however, that considerations other than these may have induced the firm to take up the system, and that the exigencies of trade forced its adoption in order to meet competition. Whatever be the reason, the fact remains, and is certainly worthy of note.

Long-Distance Power Transmission from Over-Compounded Generators.

BY LEMUEL WM. SERRELL, M. E.

If all persons were possessed of the latent power a gentleman from Boston gave proof of in one of our sister States in the Sonth a few months ago, it would be unnecessary for engineers to spend time developing the scientific transmission of power, as every one would be a walking power-plant himself. But as all do not claim such inherent sterling qualities, engineers have been compelled to have recourse to mechanical means for transmitting power, and among the principal ones may be mentioned:

The cable, or moving rope.

Compressed air, operating air motors.

Steam, distributed through pipes, to prime movers, variously situated.

Gas, both natural and artificial.

Water, forced through pipes under pressure, operating water-motors, and

Electricity.

Most people are willing to admit that electricity applied for power purposes offers far greater facilities in ease of management, rapidity of construction, most economical operation, and, consequently, a better commercial investment than any of the other methods mentioned.

The constant potential method of distributing power will, in the present state of the art, give better satisfaction than either the constant current or alternating systems, although much may be expected from both of these, especially the latter, when brought to a better state of perfection through future development.

Popular opinion is greatly agitated at present over the danger to life, occasioned by the use of high-pressure currents, and it really seems as if popular prejudice would shortly seek legislative protection from the deadly wires, and ask some of our intelligent law-makers to establish a limit to the number of volts that may be used for commercial purposes. Where would steam engineering be to-day, if its development had been hampered by laws forbidding the use of pressures of over 25 pounds in steam boilers, for fear of terrible explosions and casualties to life? Engineers have found high pressures and greater expansions more economical than low pressures, and while there have been explosions, and people killed, yet to-day pressures of several hundred pounds are used with

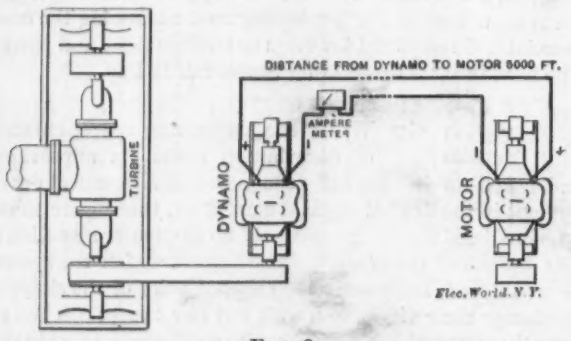


FIG. 2.

impunity, in consequence of the principles of the resistance of materials being properly applied. The day is not far distant when ten thousand volts will be handled as safely as the high pressures now employed in our steam engines.

Where power is transmitted from a distance and distributed in one place, the dynamo should be over-compounded to maintain a constant difference of potential at the motors under varying loads. This requires a specially proportioned winding on the generator, to lay out which the resistance of the external circuit must be accurately known.

Three things should be considered in detail in planning such an installation:

1. The motors.
2. The line and the method of distribution.
3. The generator.

To more clearly understand these, let us consider their relations to a practical example in detail.

Example: Required the total cost of dynamos, motors and copper necessary to transmit 100 h. p. to motors 5,000 feet away under a pressure of 1,000 volts at the motor terminals, and a loss of 20 per cent. in the line.

If a constant E. M. F. can be maintained at the motor terminals, any of the best motors on the market will work satisfactorily, if properly installed.

In considering the line work and the methods of distribution, Fig. 1 shows a curve for determining the size of wire to use, to carry a given number of ampères with a given per cent. loss; the abscissas represent various voltages from 110 to 1,500 volts, and the ordinates the corresponding constants, which, when multiplied by the mean distance, or one-half the total length of the circuit in feet, and the number of ampères to be transmitted, and divided by the per cent. loss, give the size of the wire in circular mils. That is:

$$\text{Circular mils} = \frac{\text{ampères} \times \text{mean distance (feet)} \times C}{\text{per cent. loss.}}$$

Figs. 2 and 3 show practically the conditions existing in the foregoing example. Fig. 2 shows the dynamo supplying current to one large motor, situated 5,000 feet away; while Fig. 3 shows a method of distribution that can be used where power is to be distributed in small units throughout a district. In Fig. 2 a horizontal turbine, provided with a governor to maintain a constant speed, drives a dynamo from which the line circuit extends to the motor. This dynamo is over-compounded for the resistance of the armature, the series coil and the external circuit, and maintains a constant electromotive force at the motor terminals under all variations of load. Fig. 3 shows the same general arrangement of turbine and dynamo with the feeder wires extending to a distr[illegible] station and connected to the "bus" wires, upon which a constant potential is maintained by the over-compounding of the dynamo. Where high-pressure generators are used it is very expensive to wind a shunt field of high enough resistance to stand the electromotive force of the armature; it is much cheaper to wind a shunt field for a low pressure of, say, 110 volts, and separately excite it by a small constant potential dynamo driven direct from the turbine.

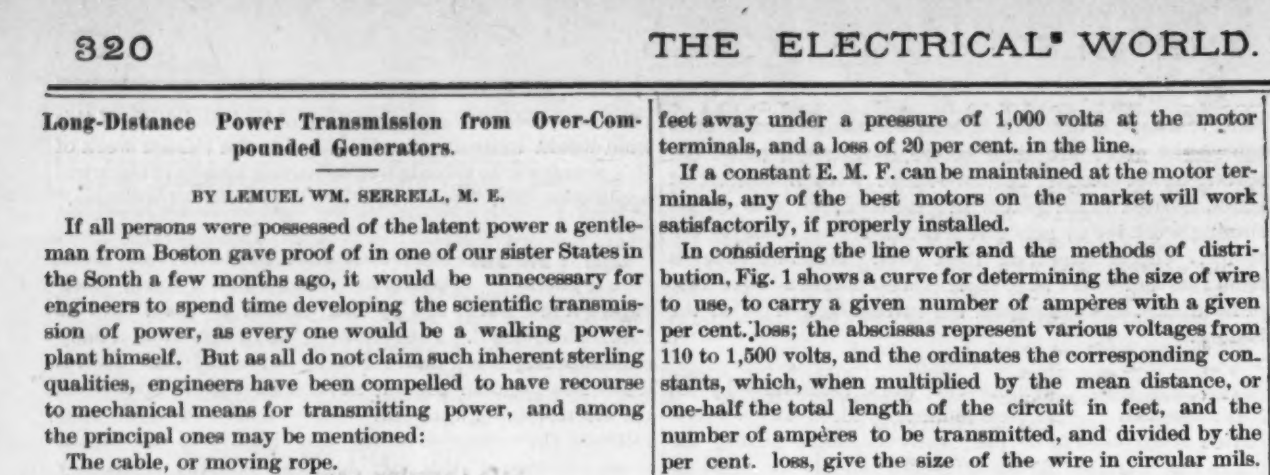


FIG. 3.—METHOD OF LONG DISTANCE POWER DISTRIBUTION.

Pressure wires should be run from the "bus" wires in the district station to a voltmeter in the main generating station, so that the pressure at the district station may be read at any time by the attendant in the main station. If for any reason this pressure should vary, a hand-regulator should be provided in the shunt field circuit of the generator to regulate the pressure at the district station.

By using the "box" or "crib" system of wiring, a large district may be wired for a small initial cost, having scarcely an appreciable drop of potential and needing no equalizers. This is effected by connecting the positive wires together and the negative wires together at each junction box, thus forming a network of positive and a network of negative wires. Should a particular portion of the circuit be overloaded the current can flow through all the wires in both the positive and negative networks, and supply all the current needed with scarcely a perceptible drop of potential. It also allows a larger district to be wired for the same initial cost of copper than could otherwise be covered.

Referring once more to the example, we find that dividing 1,000, the voltage at the motors, by .80, that the voltage of the dynamo must be 1,250 volts at full load, there being a loss of 20 per cent. in the line. Assuming the efficiency of the motors to be 90 per cent., they must be supplied with 111 h. p., or 82,800 watts, which at 1,000 volts gives 82.8 ampères.

Referring to the curve, Fig. 1, we find the constant for 1,250 volts is 1.83, and the

$$\text{cir. mils} = \frac{82.8 \times 5{,}000 \times 1.83}{20} = 37{,}875.$$

Multiplying 37,875 (the cir. mils) by 10,000 (the length of the circuit in feet), by .0000006044, gives the price of the copper at 20 cents per pound, equal to $228.92.

To construct a cumulative dynamo to maintain a constant E. M. F. at the motor terminals, it should be over-compounded for the resistance of the line, the series coil of the dynamo and the armature. Suppose that the resistance of the armature and the series coil together is one ohm, the drop at the dynamo terminals, due to the internal resistance of the dynamo, would be 82.8 volts. Therefore, to maintain a constant potential at the dynamo terminals, irrespective of the external circuit, we would have to proportion the ampère turns of the series coil so that the increase in the strength of the field would be such that the armature would develop 1,082.8 volts when supplying 82.8 ampères, the speed remaining constant. The line *A B* then, in Fig. 4, would represent the voltage at the dynamo terminals under varying loads if the series coil had no effect at all, while the line *A E* would represent the number of volts actually developed in the armature when the series coil is proportioned to maintain a constant E. M. F. at the dynamo terminals of 1,000 volts, as shown in line *A D*. The

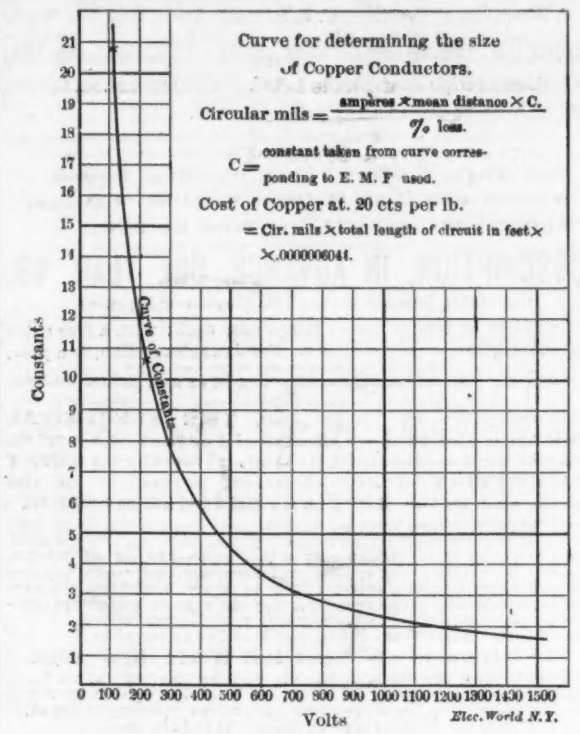

Curve for determining the size of Copper Conductors.
Circular mils = ampères × mean distance × C. / % loss.
C = constant taken from curve corresponding to E. M. F used.
Cost of Copper at. 20 cts per lb.
= Cir. mils × total length of circuit in feet × ×.0000006044.
Constants
Curve of Constants
21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
0 100 200 300 400 300 600 700 800 900 1000 1100 1200 1300 1400 1500
Volts
Elec. World N.Y.

FIG. 1.

shunt field should be of such strength that the armature will develop 1,000 volts on open circuit, while the series coil will cause the armature to develop an increased number of volts, represented by ordinates included between the lines *A E* and *A D*, corresponding to their respective ampère loads. Now, if the dynamo is over-compounded so as to maintain a constant E. M. F. of 1,000 volts at the motor terminals, it must be over-compounded for the resistance of the external and internal circuits, and the ordinates between the axis of *X* and the line *A C* would represent the voltage at the dynamo terminals under varying loads, while the ordinates between the line *A C* and *A D* would represent the compounding necessary to make up for the losses in the external circuit. But the ordinates included between *A E* and *A D* represent the compounding necessary to make up the losses in the internal circuit; therefore, the total compounding necessary to maintain a constant E. M. F. at the motor terminals would be the sum of the two; and adding the ordinates of the triangle *A D E*, to the respective ordinates of the triangle *A D C*, we obtain the line *A H*, which represents the total number of volts developed in the armature under varying loads. Now, if it took 1,250 ampère turns of series coil to cause an increase in the strength of the field sufficient to overcome the drop in the internal circuit only, and maintain a constant E. M. F. at the dynamo terminals, the series coil would have 15 turns of a wire. To maintain a constant E. M. F. at the motor terminals, the ampère

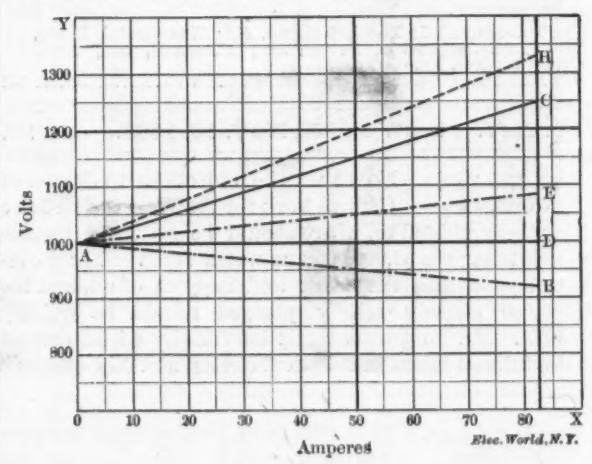


FIG. 4.

turns would be proportional to the increase in the voltage; or we should have

$$82.8 : 332.8 :: 1{,}250 : x,$$

or $x = 5{,}145$ ampère turns, which would require 62 turns of wire in the series coil, provided the machine was working below saturation and the shunt field separately excited. If, however, the shunt field is excited by the generator itself, the increase of ampère tnrns in the shunt field due to the increased current flowing through it under the higher voltage should be subtracted from the total number of ampère turns obtained above, and a series coil laid out having a number of ampère turns equal to this difference.

Coming back once more to our original problem regarding cost, we find that a dynamo having an output of 1,250 volts

and 83 ampères would represent about 140 h. p., which, at $45 per h. p., a fairly close figure for dynamos built for 1,200 volts, would cost $6,300; for 100 h. p. of motors, at $50 per h. p., we have $5,000; the line costs $228.92, making a total of:

Dynamos	$6,300.00
Motors	5,000.00
Line	228.92
Total	$11,528.92

This figure does not include any construction work, but gives an approximate idea of the cost of the electrical equipment, which would of course vary somewhat according to the number of people bidding for the contract.

The Beverly & Danvers Electric Railway.

In our issue of Oct. 19 we made note of the opening of the railway between Beverly and Danvers, Mass., the cars being propelled by current derived from storage batteries.

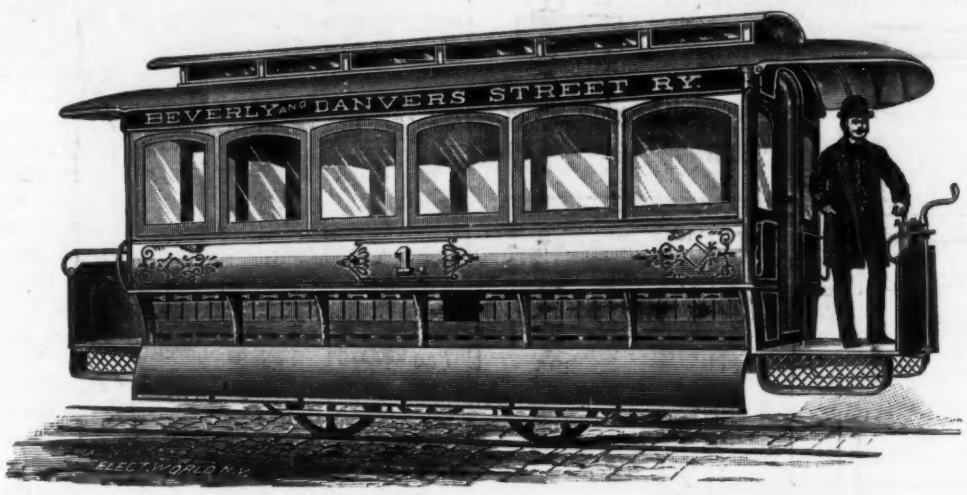


FIG. 1.—THE BEVERLY & DANVERS ELECTRIC RAILWAY.

This road, it will be remembered, is equipped with the cars of the Union Electric Car Company, of Boston, and the trucks upon which the cars are mounted were illustrated in the number referred to above. We are now enabled to present to our readers an illustration (Fig. 1) of one of the cars complete as they appear on the road, with the side doors in the car lowered, so as to expose the batteries to view.

The car house, which is also the charging station, is situated at Beverly, near the end of the track, and 90 feet long by 40 feet wide. Our illustration, Fig. 3, shows the batteries at the charging station. As will be seen, they are placed on lines of tables built on each side of the tracks, the top being on a level with the car floor, so that the trays, containing each 12 cells, are easily drawn from, or pushed into, the cars. The tables are connected by wires to the switchboard, and there by plugs to the charging dynamo, as shown in Fig. 2, the switchboard being placed directly over the dynamo.

There are four tables on each side of each track, each two opposite tables containing a set of 12 trays, containing altogether 138 cells to each set, each car being provided with two such sets. To insert the cells the car sides are let down and the six trays on each side are put into the car, the discharged set having first been withdrawn on the cars coming into the station.

The charging plant shown in Fig. 2 consists of a 30 h. p. boiler and engine, and dynamo of corresponding capacity. The boiler is in a small room by itself.

The switchboard before referred to is in the wall near the dynamo, and has plugs connecting the positive and the negative terminals of the dynamo to each of the eight tables by a separate plug. There are also two ammeters to show the amount of the charging current.

Each set of batteries is able to run the car 40 miles with a single charge, and with the two sets a car can make 80 miles per day. It takes eight hours to charge a set fully, and the 30 h. p. plant is sufficient to charge the batteries, two sets each for six cars.

The switch in each end of the car fully controls the car movement, no mechanical or hand brake being used except to hold a car when standing on a grade.

A Novel Patent Scheme.

BY A. B. WORTH.

There is, I think, a growing feeling that the time has arrived for a revision of some of our patent laws. And while such matters as the non-forfeiture of the American patent in case of failure to pay the annual taxes on the foreign patent, the Court of Patent Appeals and other reforms, are under consideration, it is my plan to suggest another one.

At present, if an inventor has an invention which he wishes to protect, and at the same time have time to develop it, his only course is in obtaining a caveat. But this method is costly, and where the inventor has a number of inventions, and is a person of limited means, it is entirely out of the question. The plan here suggested as a substitute is that the Government construct a series of vaults, somewhat similar to our "safe deposit" ones, and which could be placed under charge of the Commissioner and two or three competent men.

The inventor or discoverer would write out a complete description of his invention or process, together with drawings and a brief statement as to what he considered his discovery to be. These would be placed on deposit in the vault, and for this a small annual fee would be charged. The papers and drawings could be photographic reprints of the originals.

The advantages of this method are that papers representing any number of inventions could be placed on deposit, and that all of the money and time squandered in our courts in establishing priority would be saved.

The description of each invention or parts of one that might be deposited at intervals would be put in separate sealed and numbered envelopes, and any of these could be withdrawn by the Commissioner in deciding an interference case; but, of course, if withdrawn by the inventor, their previous value would be rendered *nil*. The deposited papers could be in the form of a regular patent application, with claims, and could be brought before the Patent Office as such at any time desired.

The plan herein outlined should in practice work as smooth as clockwork, and would save endless heartburnings in priority cases. It is evident that on account of the greatly increased and complicated matter before the Patent Office some plan of this kind will soon be a necessity. The only objection that it seems possible to raise is fraud on the part of the person in charge, and this could be overcome by placing two combination locks upon the deposit boxes, one controlled by the attendant and the other by the inventor or his representative.

Safe Carrying Capacity of Wires.

To the Editors of The Electrical World:

I have tables giving the carrying capacity of copper wire, by different authorities, and none of them agree. For instance, one issued by the Brush Electric Company, of Cleveland, gives No. 1 B. & S. as capable of carrying 120 ampères safely, while one by Mr. Geo. B. Prescott, Jr., gives it as 75 ampéres.

Mr. Prescott's rule (1,000 ampères to the square inch, sectional area), worked out for No. 1 wire, would only give 66.03 ampères. Now, as we do not always have a table of carrying capacities in our pocket, it would greatly oblige your subscriber if you will say in the WORLD whether or no Mr. Prescott's rule is to be relied on. If not, please give one that will be satisfactory. R.

MANCHESTER, N. Y.

ANSWER—The rule of 1,000 ampères to the square inch, given by Mr. Prescott, is a very safe one to follow. Many electrical engineers allow a greater carrying capacity, depending upon the situation of the wire, whether encased or in the open air and freely ventilated. The rule of the Brush Electric Company cited is not an excessive one, but would heat the wire more than the one first cited, though still within the limits of safety. For overhead circuits the Edison Company's rule would allow of a No. 1 B. & S. wire carrying about 150 ampères, at which it would be heated to about 122 degrees Fahrenheit.—EDS. E. W.

The Scientific Use of Gas at the Armstrong Works.

To the Editors of The Electrical World:

Referring to your correspondent's remarks on the absence of electric lighting at Messrs. Sir W. G. Armstrong, Mitchell & Co.'s Elswick works, in your issue for the 19th inst., as I happen to be electrical adviser to Messrs. Armstrong, Mitchell & Co., perhaps you will allow me to point out that though it is the case that electric lighting has not yet been applied to the larger portion of the works, installations, some of them of considerable magnitude, have now for some years been running for lighting the steel works, metal foundry, shipbuilding yard, sheer legs wharf and offices. In fact, the installation in one of the drawing offices was one of the earliest incandescent lamp plants fitted in this country.

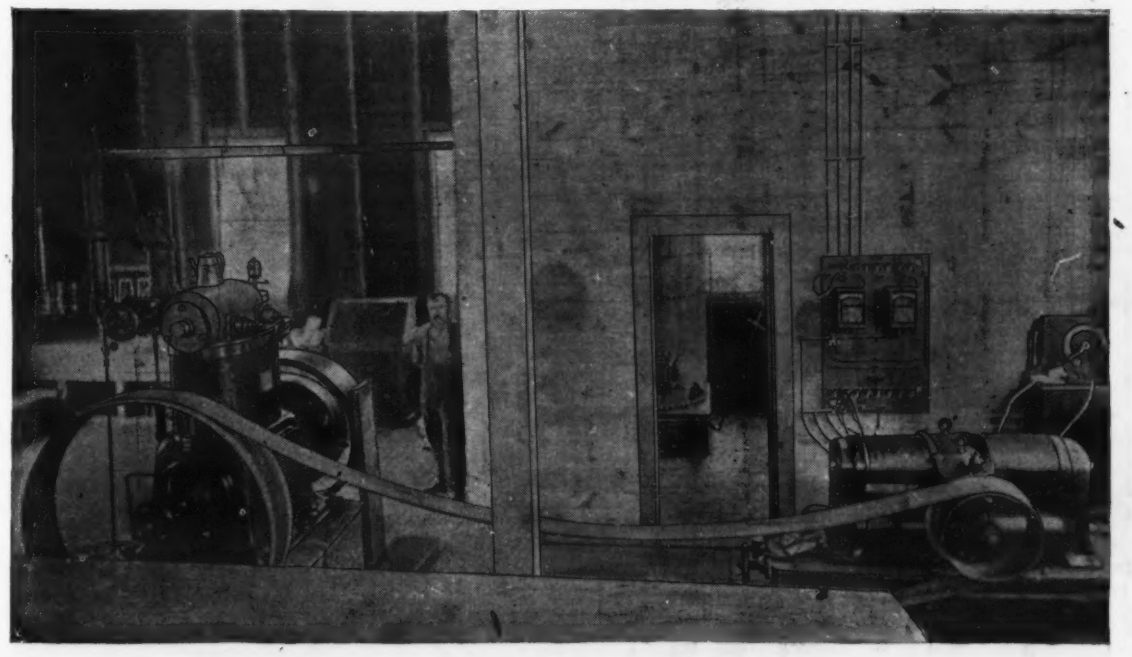
Electric light is also used for examining the interior of the guns, and for other purposes, and the company have a fully equipped electric staff of their own for fitting out complete with incandescent lamps and search lights, all the war vessels that they build.

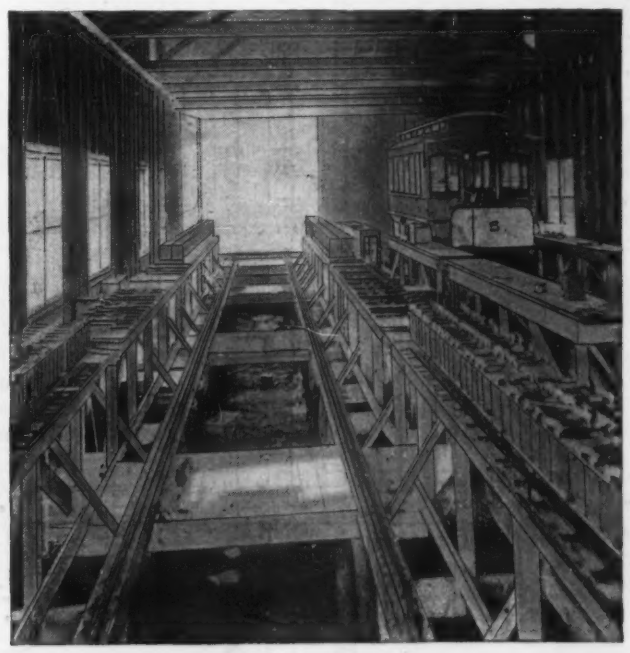
The reason why it has not been introduced into the machine shops is partly due to the very low price of gas, which is supplied to the works at about 1s. 6d. per 1,000 feet, and also because gas has the advantage of supplying a considerable amount of heat as well as light, this being a matter of no little value in a cold climate.

A. A. CAMPBELL SWINTON.

LONDON, Eng., Oct. 31, 1889.

[Our correspondent, after spending 3½ hours in the Works, saw no electric lights at all, and so stated. He could not speak for those parts of the works which he was not permitted to inspect. We are glad to give insertion to Mr. Swinton's courteous letter, but regret we cannot see the advantages, from any standpoint, of making a gas jet fill the double role of lamp and stove. The health authorities of Newcastle should give the matter their attention.—EDS. E. W.]





FIGS. 2 AND 3.—THE BEVERLY & DANVERS ELECTRIC RAILWAY STATION.

The New Electric Transfer Table at Fitchburg, Mass.

In a recent issue we gave some account of the electric transfer table lately installed at the repair shops of the Fitchburg Railroad Company, at Fitchburg, Mass. We are now enabled to supply some of the details of the mechanism employed.

This table, it will be remembered, is operated electrically by the system of the Union Electric Car Company, of Boston, and is designed to move cars from and to the various tracks, some 48 in number, in the two parallel shops, each 500 feet long. The table is 70 feet wide and 10 feet long, and runs on four rails in the pit between the shops. On the table is a track which meets and fits the tracks on either side.

One of the great difficulties found in this table, and which is the case with all such tables, was in so placing the table that it would match the tracks, as it required the help of a number of men with bars to get it into the proper position and keep it there. With the present system the man at the switch, which fully controls and governs the table in all its operations, can stop and match the tracks and hold them in position with any speed of the table.

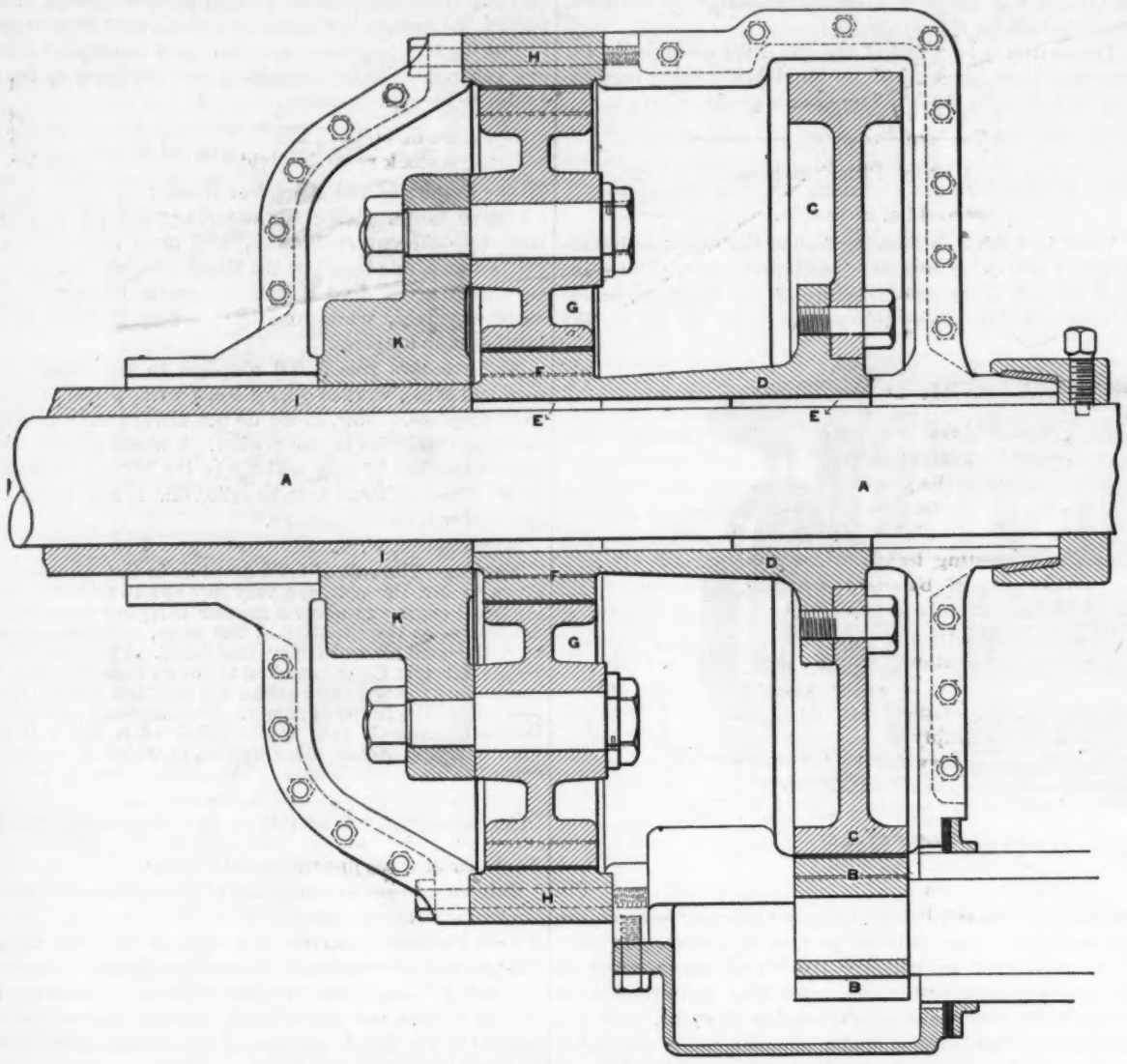


FIG. 2.—THE ELECTRIC TRANSFER TABLE AT FITCHBURG, MASS.

The cars are also drawn on and off the table by the same motor that moves it.

The accompanying engraving, Fig. 1, shows a plan view of the table as equipped at present, and Fig. 2 shows a detail of the case containing the gears. As will be seen, it is the front axle of the table to which the motor *B* is attached by the journals *C C*, being suspended at its rear end by the bolt *D* hung from the channel bar *E*. The circular case *F* incloses the driving gears, the mechanism of which is shown in Fig. 2. Within the gear case *F* the last gear in the series is clamped to a long sleeve *I*, which rotates freely in the axle of the table, and passes out from the case to the clutches *J* and *K*. The clutch drum *J* revolves freely on the sleeve *I*, and the clutch drum *K* is keyed to the axle. When the clutch collar *L* is thrown to the left the sleeve is clutched to the shaft and the motor propels the table. When the collar *L* is thrown to the right, the sleeve is clutched to *J*, which, through gears *M* and *N* and bevel wheels at *O*, operates the capstan *P*, which is used to haul cars on and off the table. When the clutch *J* is in operation, *K* is of course free, and vice versa. The clutch collar *Q* and shaft *R*, lever *S*, and links *T T* operate the mechanism for shifting the commutator brushes, in order to reverse the direction of rotation of the commutator. *U* is the electric switch which governs and controls all the movements of the table.

The bearings *V* and *W* were added to the table to support the extra weight thrown on the shaft by the motor gearing and clutches.

The extension of the table for supporting and inclosing the motor and gearing is floored and housed over to protect the operator and apparatus from the weather, and access to the apparatus is had through traps in the floor.

The engraving Fig. 2 shows a horizontal cross section through the gear case. Here *A* is the axle of the car, which rotates free of any attachments in the case. The pinion *B* is keyed to the armature shaft and engages the large gear *C*, which is mounted on the sleeve *D*. The latter rotates on the shaft *A*, on bushings *E* and *E*, and is formed at *F* into a pinion, which engages the gear wheels *G* and *G*. These gears are intermediate between the pinion *F* and the internal gear wheel *H*, which forms part of the gear case *F*, in Fig. 1, inclosing the whole. The gears *G G* are fixed by stud pins to the spider *K*, which, in turn, is clamped to the sleeve *I*. The latter passes to the outside of the case to the clutches, as shown at *I*, Fig. 1.

It will be noticed that the rotation of the pinion *F* causes the gears *G G* to travel round in the internal gear *H*, carrying with them the spider and attached sleeve. The case is filled to a depth of six inches with a light spindle oil, which, when the gears rotate, completely drenches every part of the interior of the case with oil, and through oil passages reaches every part of the bearing surfaces. The large gears *C C* working in the recess of the case act as a centrifugal pump, pouring a constant stream of oil on the motor pinion with such effect that after a month's constant use of the table, the "new" had not worn off the armature pinion, which is the hardest used gear in the case.

The motor is run by the lighting dynamo of the shops, and is connected by a complete metallic circuit of double trolley wires. The whole operations of the table and dynamo require the services of but three men, who are thus enabled to accomplish some four times the work formerly done by twelve men and a locomotive and its men. Its great convenience is acknowledged by the railroad company. It has been visited and examined by scores of railroad people.

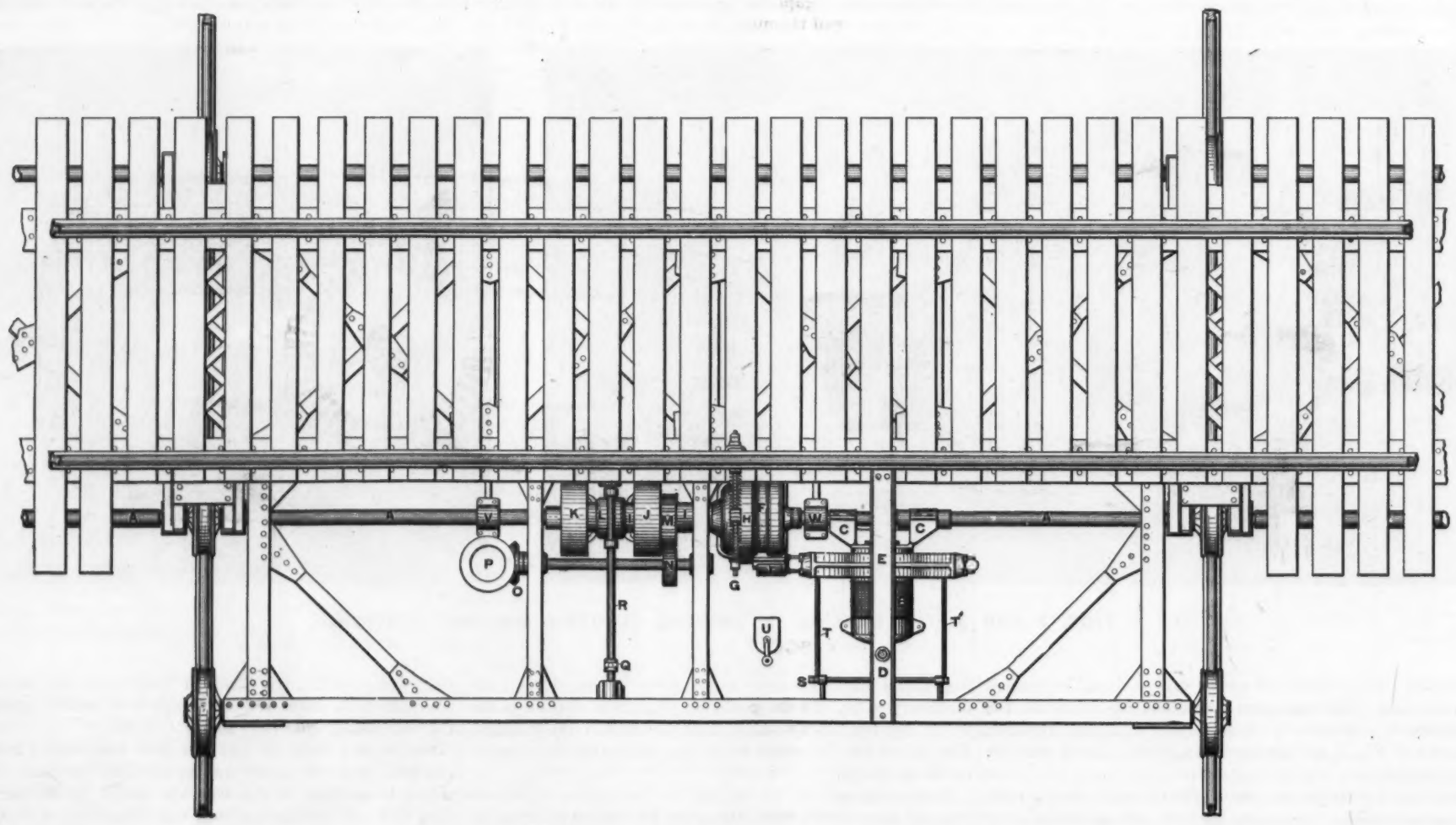


FIG. 1.—THE ELECTRIC TRANSFER TABLE AT FITCHBURG, MASS.

The Passage of Electricity Through Gases.*

BY ARTHUR SCHUSTER.

The author has, during the last two years, investigated the distribution of potential in the neighborhood of the negative pole of discharge of electricity through rarified gases. Knowing the rate of fall of potential, it can be determined whether there is any bodily electrification in any part of the negative glow. It was found that the cathode is surrounded by an atmosphere of positively electrified gaseous particles extending to the outer edge of the so-called dark space. According to the author's views this atmosphere corresponds to the polarized layer adjoining the negative electrode in an electrolyte. The cause of the sudden difference in luminosity between the dark space and the negative glow has also been investigated, and it

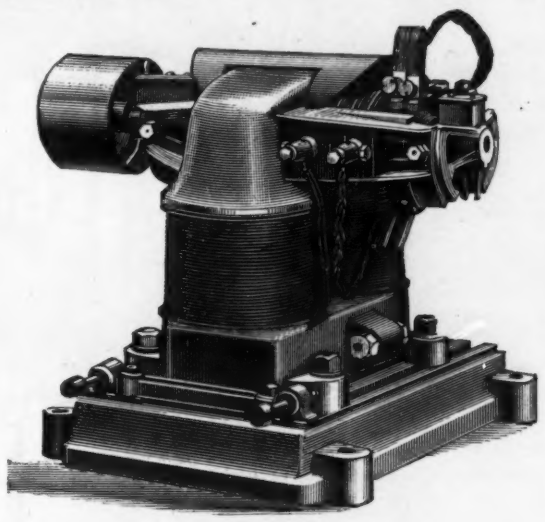


FIG. 1.

has been found that the negative particles projected from the cathode pass unhindered through the dark space, while their velocity is quickly reduced in the glow proper, the translatory energy being thus changed into energy of vibration.

Laurence, Paris & Scott Exhibit at the Birmingham Electrical Exhibition.

The application of electricity as a motive power was very well exemplified at the Birmingham exhibition recently held in England, by the various motors exhibited by Messrs. Laurence, Paris & Scott, Limited, of Norwich, England. In one part of the exhibition an 18-inch circular saw was driven; at another place a ventilating fan; and still others were at work driving a silk loom, an electro-plating dynamo and a printing press. These motors are of the type shown in Fig. 1, and are shunt wound so as to run at a constant speed. They include, however, a very simple and ingenious starting arrangement; this consists of a few series coils wound on the field magnets so as to energize the field the instant the current is turned on. The same current, of course, passes through the armature, which immediately begins to revolve very rapidly, generating its counter E. M. F. in a very short time, when the series coils are switched out, leaving the machine to run as a simple shunt motor. These machines are built in sizes ranging from 1½ h. p. upward.

The generating dynamo made by this firm was also exhibited. Two of these were at work in the main engine room, one compound wound for 120 ampères at 100 volts, while the other was shunt wound. Both were employed in driving the exhibits of the firm and in providing current for the lamps in the Edison-Swan Company's exhibit. The illustration, Fig. 3, shows the machine in perspective; and Fig. 4 shows the construction of the magnetic circuit. The armature, it will be noted, is built up of thin discs of iron insulated from each other and mounted upon a hexagonal shaft. The wire is imbedded in a single layer in the hollow formed between the teeth at the periphery of the armature.

Among the various accessory apparatus shown by this firm, we also note the magnetic cut-out illustrated in the engraving, Fig. 2, the operation of which will be readily understood. It consists of two mercury troughs in which two bent copper wires are supported on a frame which is held in position by the armature of the electro-magnet. Any excessive current raises the armature of the magnet and trips the pivoted cross connection, which allows the two bent wires to rise and break the connection between the two mercury troughs, thus breaking the circuit.

There was also exhibited by this firm a very neat combined engine and dynamo for private and ship lighting, which attracted considerable attention.

* Abstract of a paper read before the British Association, Sept., 1889.

The Edison Exhibit at the Paris Exposition.

We have already given our readers, in the shape of Mr. W. J. Hammer's Franklin Institute lecture, a very full and interesting account of the great Edison exhibit at Paris, where, next to the Eiffel Tower, it was the leading and most popular feature. We are now glad to be able to supplement that interesting technical description, and the illustrations it embraced, by a large view of the exhibit as a whole. With regard to the picture, pages 324 and 325, our Paris correspondent writes:

"From these illustrations you will appreciate what this exhibit really is. Every one pronounces it a wonder, and it is really so. The artistic 'big lamp,' with its 20,000 incandescents, is not simply a monument to the capacity of the Edison Lamp Factory for 24 hours' manufacture, but is a most ingenious combination of electrical effects. One picture represents the large switch-board controling the circuits in the lamp alone, and it takes the entire attention of two men and several automatic devices to keep these different circuits 'flashing.'

"Many different combinations of colors and effects can be obtained at will. Crowds of enthusiastic people gather in front of the two intertwined flags of France and America as they are lit at stated intervals, and flashed in connection with the other circuits. Even the big American eagle over Edison's bust, and the owls at the sides of the office door, have lamps in their eyes, which are made to blink at regular intervals by means of an automatic flashing device run by a small motor.

"The Telegraph and Physical sections are both shown. On the latter space stands one of Edison's megaphones, which attracts much attention, especially from the country people who come flocking in. So great a nuisance did the crowds around the megaphone become, all anxious for a chance to howl or wail through one of the big trumpets, that the apparatus was connected to the dynamos with a ground connection on a damp rug in front of the instrument. The result was that people would "catch it" through the hand, ear, eyebrow or lip, and many amusing scenes were the result. The 200 volts served their purpose to a marked degree.

"The dynamo space, with the smoothly-running dynamos, polished brass work and handsome switch-board, attracts much attention, and the 1,200-volt municipal machine, with its sparkless brushes and highly-polished commutator, surprises all who see it. On top of the big No. 60 dynamo, which is tested to run 1,360 ampères at 140 volts, and is the largest Edison machine made, is a tiny machine, an exact counterpart of its large companion, with the exception of size. This is the smallest Edison dynamo, and has a capacity of but five 16 c. p. lamps. In this space is also to be seen a large table covered with electrical appliances, and some of the Edison arc lamps.

The adjoining section is devoted to the underground system of distribution, and here a very neat display has been made with the different junction boxes, tubes, and joints. An exhibit of wires manufactured by the Edison Machine Works is also to be found here.

"The dynamos are connected to the main driving shafting through the medium of a countershaft, which has been placed out of sight between the partitions which form a commodious stock room, a view of which is shown in the drawing. The countershaft was belted to the main shaft from a friction clutch, by means of which the dynamos could be started or stopped at will, The space directly in the rear of the stock room is divided into three sections,

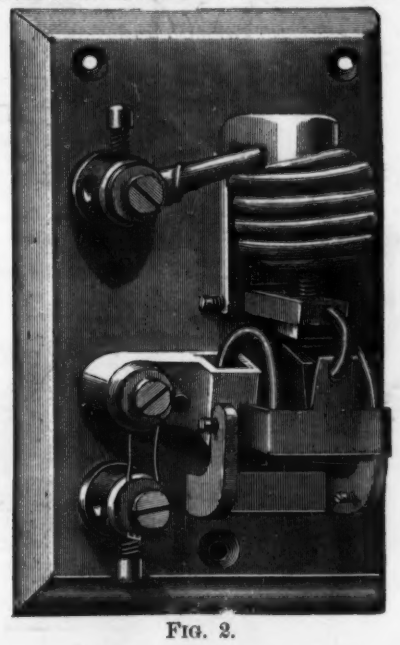
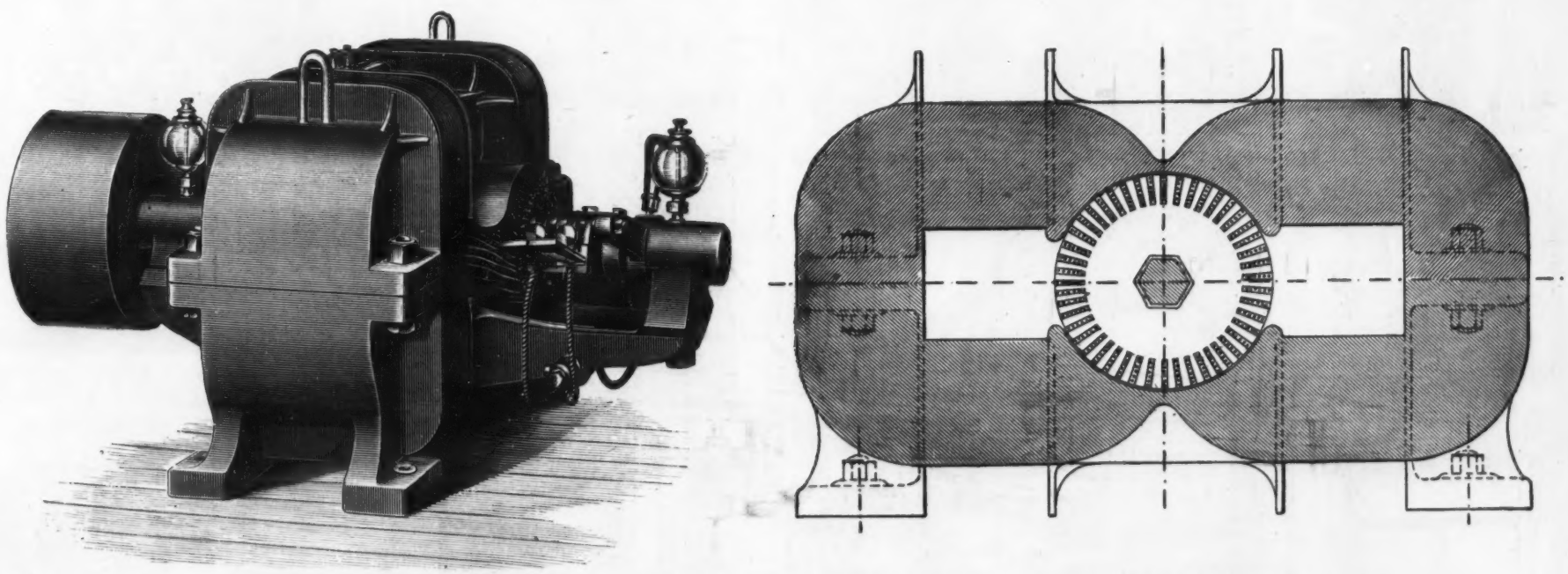


FIG. 2.

occupied by a fine exhibit of Edison meters, from the first experimental ones to the perfected ones of the present day; by a number of cases illustrating the process of manufacture of the incandescent lamp, and by the Edison ore milling and separating machine.

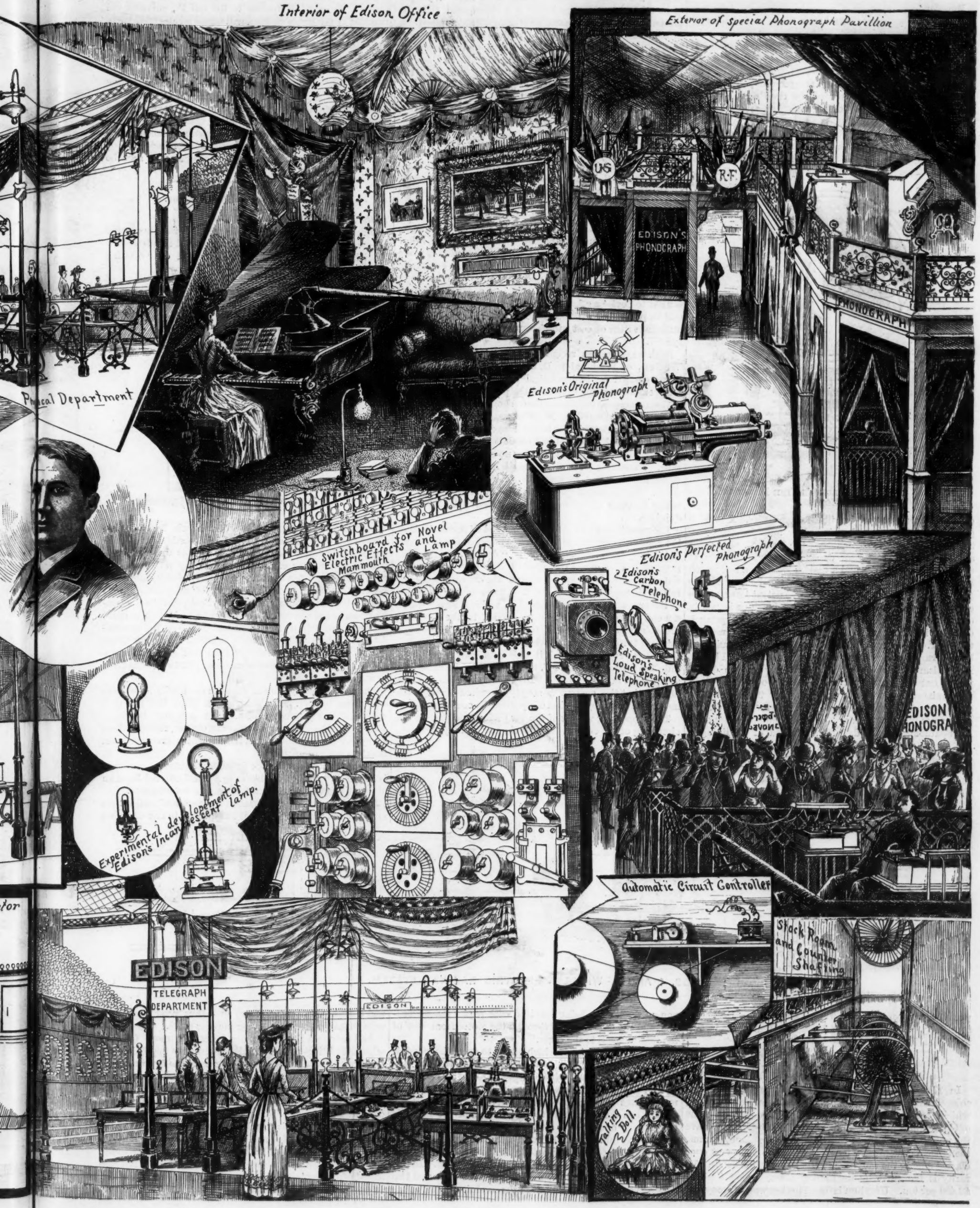
"On the partition is an immense symbolical oil painting illustrating the 'birthplace of the incandescent light"—Menlo Park—in midwinter at dusk. From the centre of the buildings rises the ghost of a mighty lamp, whose evanescent rays reach to all parts of the civilized globe and rest on medallions containing representative buildings of the different countries lit by the Edison lamp. There are also charts giving the results of the Franklin Institute lamp tests and statistics showing the growth of the Edison business in America during the last eight years.

"The remaining section in Machinery Hall is occupied by the Edison phonograph and telephone, and by a pavilion used as office and reception room for special guests invited to examine the new talking machine. Some of the best musicians in France, both vocalists and instrumentalists, have been in here and made some beautiful records, which have delighted thousands of visitors to the Exposition for weeks afterward. In this section eight phonographs are running ten hours a day, and do not know an idle moment during that time. In the American Industrial Section is a special phonograph pavilion, which is handsomely fitted up, as will be seen from the illustration, and attracts many visitors. Each day the phonograph is shown to twenty thousand persons, and on fête days, as many as thirty thousand have been accommodated. There is as great a crowd about the phonographs as there is on the Eiffel Tower, and it seems to be justly appreciated. The Exhibition is now drawing to a close, but through Mr. Edison's desire to have his exhibit considered simply as a scientific display and not a money-making scheme, over three millions of people have heard the phonograph without paying a cent."



FIGS. 3 AND 4.—LAURENCE, PARIS & SCOTT'S DYNAMO AT THE BIRMINGHAM EXHIBITION.

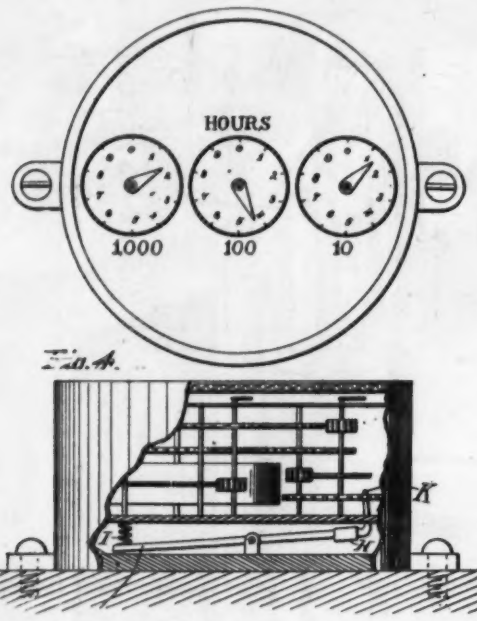
Glimpses of the Great Edison Electrical and Phonograph



raphic Exhibit, Paris Centennial Exposition of 1889.

Spaulding's Time Recorder for Electric Motors.

In order to avoid waste of power by consumers, it is often desirable to place some control upon them, and various devices have been employed in the shape of meters for the purpose of indicating the time run and current consumed by the motors. Where motors are supposed to generate their full power at all times, of course, the amount of current is a fixed quantity and needs no recording, and therefore it is only necessary to record the time during which the motor is running in order to arrive at some basis of charge. A very ingenious device for accomplishing this has recently been patented by Mr. H. C. Spaulding, of Boston, the advantage of which consists in the fact that it introduces no dead resistance into the circuit nor in any other way interferes with the regular operation of the ma-



Figs. 1 and 2.—Spaulding's Time Recorder For Motors.

chine. The accompanying illustrations, Figs. 1 and 2, show the time recorder in plan and in part section; while Fig. 3 shows the same as actually attached to a motor or dynamo. As will be seen, it consists of a clockwork and a dial inclosed in a box which is fastened to the pole piece. Within the box, and close to the iron of the magnet, is placed a detent lever, which carries an iron armature *H*. When the machine is not in operation, the detent *K* is pressed upward by the spring *I*, catching in the wheel work and stopping the movement of the clock. As soon as the motor is thrown in circuit and started running, however, the armature is attracted by the magnetism induced by the field magnets and the detent pulled out of contact with the wheel, so that the clock mechanism starts to work. In this way the exact time during which the motor is in operation is recorded on the dials, from which the charges can be computed with ease. Mr. Spaulding has also devised a method of obtaining a permanent record upon a time card. The principle of recording, however, remains the same as that of the instrument just described.

A Valuable "Find" of Uranium.

In 1789 Klaproth succeeded in isolating from a dark colored mineral known as pitch-blende a yellow oxide, which, after carefully testing, he pronounced to be the oxide of a new metal. To this metallic substance he gave the name of uranium, so calling it after the planet Uranus, then recently discovered by Herschel, and it was at once classed among the rare metals, and still remains so. Its rarity is indicated by its market price, which is about £2,400 per ton. Uranium is found in Cornwall, Saxony and Bohemia; but up to the present time it has only been met with in isolated pockets and patches. The centenary of its discovery by Klaproth has, however, been marked by the finding of a continuous lode at the Union Mine, Cornwall. This discovery is regarded as unique in the history of the metal, for the lode is what is known as a true fissure vein, and the ore is found to contain an average of 12 per cent. of the pure metal, the assays going up as high as 30 per cent. in some parts of the lode. It is anticipated that the present discovery will enable several important applications of the metal to be followed up. Uranium may, for instance, be used as a substitute for gold in electro-plated ware, inasmuch as with platinum and copper it forms two beautiful alloys, each having the appearance of gold, and the former also resisting the action of acids.

The Wheless Electric Railway System.

Notwithstanding the success which has attended the operation of electric railways with overhead conductors, some municipalities are averse to the granting of privileges for running such lines within their city limits, and recourse must, therefore, be had to an underground system where it is desired to work direct from dynamo to motor.

There are several methods which may be employed in such cases, the best known of which is the conduit system, in which the conductors are placed in an inclosure below the surface of the track, and to which connection is made by means of a contact plow. Objection has, however, been raised against this method on account of its comparatively high cost and other reasons, and hence inventors have sought to devise a scheme by which the conductor might still be placed below the surface of the street without the attendant item of cost attached to the conduit and plow system.

Such a system has recently been devised by Mr. Malone Wheless, of Washington, D. C., and experiments are now being carried on in a practical way, which, it is hoped, will demonstrate the success of the plan.

The accompanying illustrations show diagrammatically the system employed by M. Wheless, though in practice some of the details have been changed. As will be seen, the conductor *E E'* is laid in a conduit between the tracks and is completely covered, leaving no opening between the rails. Extending from the conduit line, at *f f'*, are wires which are attached to separate rails on one side of the track. By the use of these wires the current can be circuited through the motor and then be led back to the conduit line.

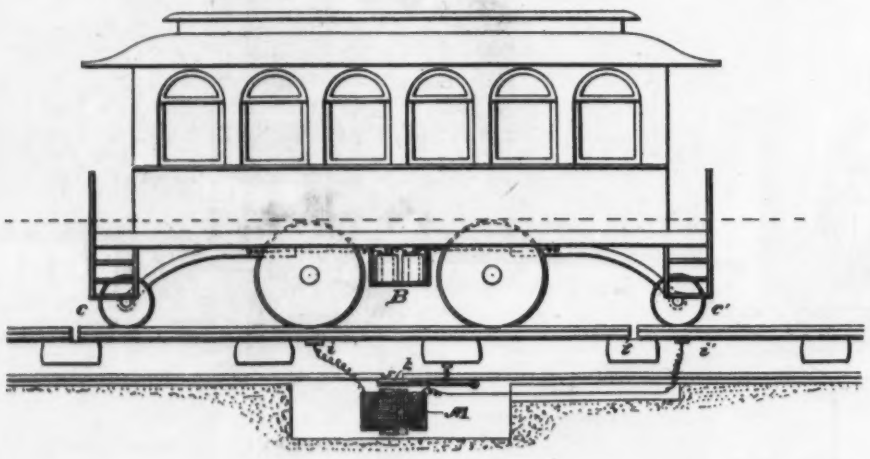
The armature *K*, Fig. 1, of the magnet *M* serves to keep the conduit line closed at *r* by resting against the two ends of the line when the magnet *M* is "dead;" but when the magnet *M* is energized the conduit line is opened by the withdrawal of the armature *K*, and the current seeks the rail *W* through the wire *f*. It then flows in the direction of the arrow into the small wheel *n*, which is supported on a metal arm *o*, and is from there carried to the motor *D*, thence along the line *p* to the metal arm *o'*, and passes down this arm through the small wheel *n'* to the rail *W'*. When the current reaches this rail it must pass back to the conduit line through the wire *f'*, as the opening or insulation at *z* gives it no other route. In other words, it will be noticed that the current is simply circuited through the motor on the car by the fact of opening the conduit line at *r*.

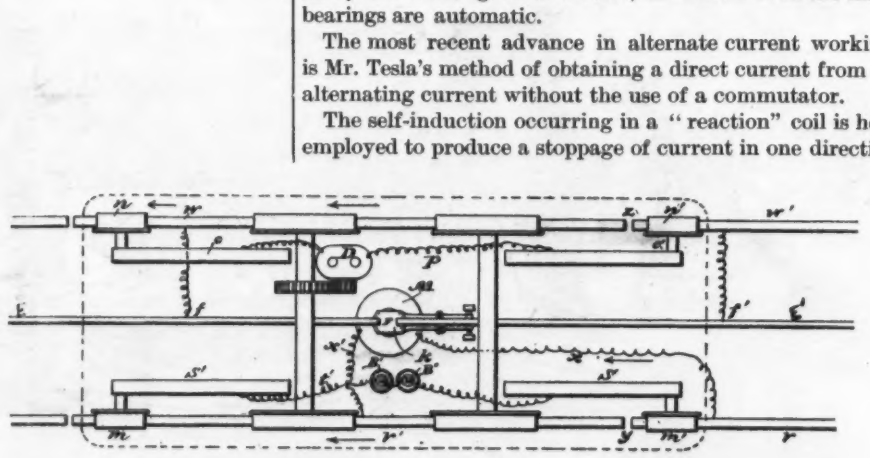
The supporting wheels of the car perform no part in the circuiting of the current through the car, as they are made non-conducting by being provided with papier maché centres, and the current flows through the motor from one of the small wheels to the other.

The magnet *M*, Fig. 1, which serves to open the conduit line by withdrawing the armature *K*, is energized from a storage or other battery placed upon the car, as shown at *B*, Fig. 2. The two small wheels *m m'* are supported by metal arms similar to those shown at *n n'*, and occupy a distance on the car greater than the length of the rail. In this manner one wheel is always on one rail and one wheel on the next rail. It will be noticed that the wires from the magnet in the conduit are fastened in like manner, *i. e.*, one wire to one rail and the other wire to the next rail. In this way the contact of the small wheels *m m'* with the two rails serves to close the circuit in the conduit magnet as the car moves.

The manner in which this is effected is as follows: *B' B''*, Fig. 2, are cells of the battery carried on the car. From *B''* one wire is led to the metal arm *S*, and thence to the rail *V*, through the small wheel *m'*. Now the rail *V* is separated or insulated from the rail *V'* by the opening at *y*. Therefore, the current traverses the line *x* in the direction of the arrow, passes around the magnet *M*, thence to the wire *x'*. From *x'* it travels to the rail *V'*, pursuing the direction of the arrow to the small wheel *m*, and from there to the metallic arm *S'*; thence along the wire *t'* to the other pole of the battery at *B'*, and the magnet *M* is energized. The result of this vitalization, as already shown, is to open the conduit line and throw the circuit around through the motor on the car. This operation is repeated as the car passes over every rail, and a uniform speed is acquired. The connections of the magnets to the track are shown at *i i'*, Fig. 1, *i* being fastened to one rail and *i'* to the other, the insulation or opening *t* keeping the wires from being fastened to a continuous conductor.

It is expected that a trial of the system will soon be made.





FIGS. 1 AND 2.—WHELESS ELECTRIC RAILWAY SYSTEM.

Commutator or No Commutator.

To the Editors of The Electrical World:

Those interested in the development of the alternating system for general distribution, cannot fail to admire the beautifully simple and ingenious method of "rotating magnetic poles" employed by Mr. Nikola Tesla in his alternating current motors. Mr. Tesla's method is interesting not only from the fact that it records a new application of alternating currents, but also by reason of the entire absence of a commutator upon either motor or generator. There is no other part of a dynamo that is subject to such deterioration, and whose presence is so unwelcome as the commutator. It would have been a great advance, indeed, if Mr. Tesla had removed the commutator and substituted one or two, or even six collector rings; but Mr. Tesla has gone further than this, and produced a motor which does not have so much as a sliding connection of any kind.

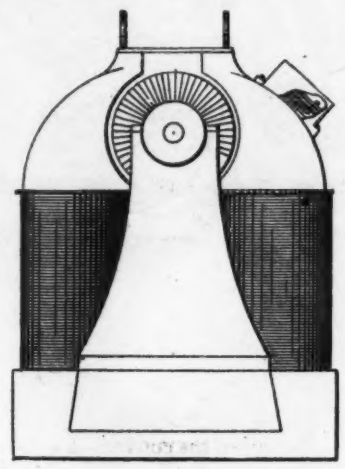


Fig. 3.—Spaulding's Motor Time Recorder.

There is, probably, no one who can more fully appreciate the value of Mr. Tesla's invention than the practical central station manager, who, after scraping bearings, setting brushes, and turning up commutators, replaces them all by the Westinghouse motors, in which even the main bearings are automatic.

The most recent advance in alternate current working is Mr. Tesla's method of obtaining a direct current from an alternating current without the use of a commutator.

The self-induction occurring in a "reaction" coil is here employed to produce a stoppage of current in one direction and a double flow in the other, and thus produces the results without apparatus having moving parts.

And now that the public are becoming more familiar with alternating currents, and beginning to appreciate the absence of a commutator, there comes to the front a "new and useful improvement" in alternating current motors, a machine having, not one, but *two commutators*. One commutator being, as it is, a nuisance, what then must two commutators be?

The inventor of this machine, instead of seeking to dispense with complicated and troublesome parts, has doubled those parts. Instead of an advancement, it is a retrograde step. In fact, it is a monstrous anomaly which is not possessed of one reclaiming feature or a single excuse for life. In short, there is no earthly use for such a machine, and the sooner the public is aware of this the better. What the public needs far more than anything else in the field of distribution is a direct-current machine suitable for arc or incandescent, with two collectors instead of a commutator. The one who produces it deserves a monument.

Altoona, Pa. H. Franklin Watts.

Paget's New Alternate Current Transformer.

The modern construction which has been generally adopted for converters or alternate current transformers, is one in which the magnetic circuit is entirely closed, there being no free magnetic poles. In this arrangement it is evident that the amount of magnetic material acted upon is always a fixed quantity so far, at least, as the primary circuit is concerned. While this arrangement leads to very high efficiencies at full loads, that is, when the converter is working at its highest rate, it has been shown that at lower rates of working, and when the converters are not operating at their fullest capacity, the efficiency is not so high. This is obvious from the fact that if a given amount of electrical energy is required to magnetize and demagnetize the primary core on account of its magnetic capacity under all conditions, whether with or without a load in the secondary, then, when there is a minimum number of lamps in use in the secondary circuit, there will necessarily be much less expenditure of energy in the primary circuit. In order to overcome this difficulty of unequal efficiencies at different loads, Dr. Leonard Paget, of this city, has recently designed a type of transformer which adapts itself to conditions existing in the secondary circuit; that is to say, a transformer which causes the amount of energy utilized in the primary circuit to bear a fixed proportion to the amount of energy required in the secondary circuit in which the lamps are situated, and he accomplishes his object by varying the magnetic circuit in accordance with the load on the converter.

The accompanying engravings show one form of this new type of converter, Fig. 4 being a plan view showing the circuit connections of the primary and secondary circuits, and Figs. 2 and 3 respectively a side elevation and vertical section.

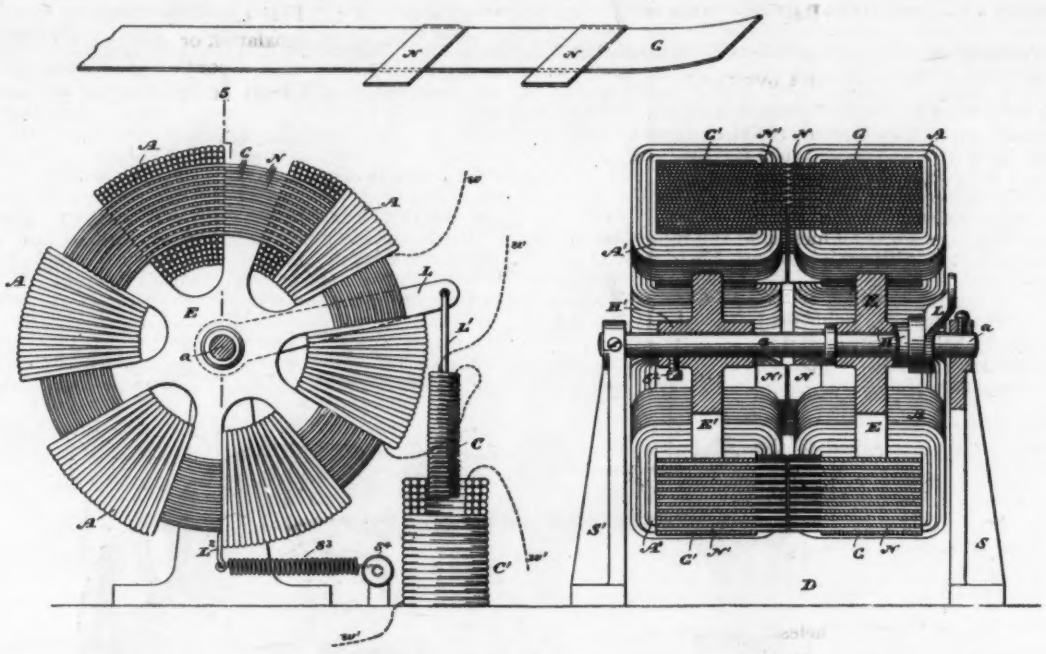
As will be seen, the converter is mounted upon two standards S S' by means of an iron shaft A, which is clamped tight in its bearings by means of the screws shown. Mounted upon the shaft are two iron spiders E E', which carry a pair of converter coils A A', the former A constituting a set of primary coils wound in series about the laminated cores G, and made of long, thin strips of iron having projecting teeth N N', which constitute the poles of the respective coils, and between which teeth are wound in series on each core the coils A A'. The arrangements is such that when the coils are wound in position the projecting teeth N N fill the space between the coils on one side and N' N' between those on the other side.

The secondary coils A' A' are rigidly fixed upon the axis a by a set screw, which passes through the hub H, while the primary coils A A are free to rotate upon the axis a, and have a lever L, connected to the hub H, for producing the rotation. This lever L has connected to its free end a solenoid C, located directly in the primary circuit and in series with the coils A, as shown in Figs. 2 and 3. An additional solenoid C' is located in the secondary circuit and surrounds the first-named solenoid. The spiral spring s^3, attached by the lever L^2, to the rotary primary coils, and by an adjusting screw s^4 to a fixed standard, is designed to regulate the relative location of the cores N N' of the movable and fixed coils under varying conditions.

With this construction the operation of the converter will become evident. Suppose, for instance, that the adjusting screw s^4 is so adjusted that the spring s^3 will hold the coils A in the least effective position when a minimum number of lamps are located in the secondary circuit w' w'; then, as the lamps are connected in circuit in the usual manner, the influence of the cores N N' upon each other, together with the additional influence of the solenoids C and C' upon each other in their respective circuits, will cause the coils A to be rotated in the direction of the arrow shown in Fig. 4. This rotation will continue in succession as lamps are cut in to the circuit until a maximum number is reached for the adjustment of the spring s^3, at which time the poles N N' will lie directly opposite to each other, as shown in Fig. 4, and the multiple magnetic circuits through the twelve adjacents poles of the primary and secondary coils will assume a position of maximum efficiency, the regulation for intermediate positions, as required by varying numbers of lamps in the secondary circuit, being at once obvious, the magnetic circuits varying in accordance with the regulation indicated.

Dr. Paget finds it advantageous to build up the two sets of coils of thin iron strips G G' having magnetic poles N N' located at definite intervals in each set and the strip rolled out is shown in Fig. 1.

With the construction and principle explained above it is claimed that the efficiency of the transformer is uniformily high for all loads.

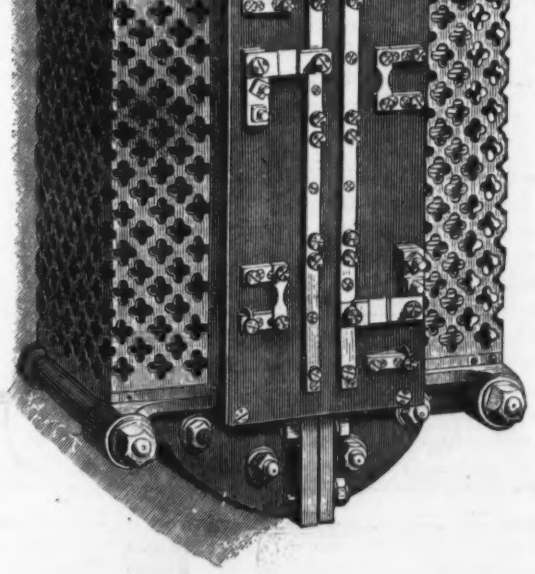


FIGS. 1, 2 3 AND 4.—PAGET'S NEW ALTERNATE CURRENT TRANSFORMER.

Siemens & Halske's Transformer.

At the Exhibition of Apparatus for the Prevention of Accidents now being held in Berlin, Messrs. Siemens & Halske exhibit a variety of work consisting of both continuous and alternating apparatus. Among the former there is exhibited a multipolar machine, the arrangement of which is quite similar to that of the machine illustrated in our issue of October 26, in which the commutator is placed on the outside of the Gramme ring.

The alternating current transformers have attracted considerable attention, as they are the first of this class of apparatus shown by Messrs. Siemens & Halske. The accompanying illustration taken from the *Ztsch. f. Electrot.*, shows the appearance of the transformer, which consists of two parts clamped together so as to form a continuous magnetic circuit which is surrounded by the coils of wire. Each of the halves is first wound on a lathe with the primary and secondary wires. The cores are built up of thin sheet iron. The enclosing case is provided with a plate of fire-proof insulating material, and carries the terminals for the primary and secondary as well as two safety strips for each. The windings are carefully insulated from the body of the iron, and in order to prevent the high potential of the primary winding reaching the secondary to which the lamps are attached, the insulation between the primary and secondary has imbedded in it a safety winding, one end of which is connected to earth. One of the transformers exhibited is designed for 10,000 watts, and the other for 5,000, the weights of the two being as eight is to five.



SIEMENS & HALSKE TRANSFORMER.

New Standard Resistance Box and Bridge.

As our readers may be aware, Messrs. Queen & Co., of Philadelphia, recently undertook the manufacture of the high-class electric-measuring apparatus, designed by Prof. W. A. Anthony; and as one of the first efforts in this direction they have lately brought out the new standard resistance box and Wheatstone bridge illustrated in the accompanying engraving.

NEW RESISTANCE BOX.

The coils in this set consist of ten $\frac{1}{10}$-ohm coils, ten units, ten tens, ten hundreds, and ten thousands, giving an aggregate resistance of 11,111, and these coils, instead of being set in circles, as in the Elliot form, are arranged in rows; this plan greatly aids in the cleaning of the rubber top, an operation of much inconvenience in the dial pattern instrument.

The placing of these coils in rows instead of in circles also makes possible another use of this set, which is one of its most valuable features, viz., a device by which the coils of each row may be connected either in series or in multiple arc at will and with equal facility; for example, taking the row of coils marked units, if the plug be placed to the right of the block marked 0 and to the left of the block marked 10, we have a resistance of 10 ohms; while placing the plugs at the right of block 0, to the left of block 1, to the right of block 2, and so on through the row, puts the same ten coils in multiple arc, and, consequently, gives a resistance of one-tenth ohm. This not only allows

of easily comparing the individual coils with the standard, but is of great advantage in comparing them with one another; for instance, each one-tenth ohm may not only be compared with all the others but also with the row of unit coils placed in multiple, and so on through each row, thus making errors in the adjustment of the set well-nigh impossible when the work is conscientiously and carefully done.

The bridge arms consist of one, ten, one hundred, one thousand, and ten thousand ohms on each side. By a special device they may be quickly reversed by the simple change of two plugs.

One of the most valuable features of this set is the method of determining its temperature, a device for which has been lately added.

For this purpose Prof. Anthony has made use of an extra coil, which he calls a "temperature coil." The latter is of copper wire, whose temperature coefficient has been carefully determined by several measurements made while the coil is immersed in water at different temperatures. Then, since the temperature coefficient of copper is higher than that of platinoid, with which the set is wound, the apparent resistance of this temperature coil, measured in terms of the coils of the set, will rise or fall as does the temperature. In this way the change of temperature from the standard temperature of the set can be readily computed. To be more specific, the temperature coefficient of copper is .004, while that of platinoid is .00024, which gives a difference of .00376, as the coefficient on which the copper coil will increase or decrease in apparent resistance, *i. e.*, measured in terms of the platinoid, for each degree centigrade change of temperature. If, now, the coil is wound so as to measure 266 ohms at the standard temperature, it is evident that a change in its apparent resistance of one ohm will mean a change of one degree in temperature, while fractional changes of resistance will indicate the same fractional changes of temperature. This, it is obvious, gives a far more accurate means of determining the temperature than is possible by the use of a thermometer, as a $\frac{1}{1000}$ ohm resistance can be measured with considerably greater percentage of accuracy than $\frac{1}{10}$ degree centigrade by means of a thermometer. The temperature coil is conveniently placed among the other coils and connected in such a way that by simply throwing over the copper strap at the right-hand lower corner into the adjoining post the coil takes the place of the usual unknown resistance, and is measured immediately without any further change of connections.

In this set, as it has been improved, a number of changes have been made in minor details; thus the exact size and taper of the plugs has been carefully reconsidered and changed so as insure a more perfect fit and contact, and all connections have been made of ample size so as to introduce as little resistance as possible.

We may add that these instruments are carefully adjusted by Professor Anthony, being compared with the Cavendish standards. Sets similar to the one described have recently been added by the Princeton College electrical engineering laboratory, the Chicago Edison Company, Ohio State University, California Electric Light Company and others.

Continuous Currents Without a Commutator.

To the Editors of The Electrical World:

Referring to the discovery of Mr. Tesla, described in your issue of Nov. 2, I may say, without lessening any credit due him, that early last summer, after reading in The Electrical World of the difficulty of starting an alternating motor, I called to mind a remark of Mr. Chas. F. Brush, "that the electric current was a gentleman; it was very polite, because a strong current would not trespass upon the circuit of a weak one." This arose from his discovery that the Brush arc current would go round through a resistance rather than stop a weak battery current.

From this fact I was led to make some rough drawings of a motor supplied with an alternating current, with the poles of a primary battery connected to its two terminals, so as to tend to run it in a predetermined direction, in the same manner as a direct-current motor; the two poles of the alternate generator were also connected to the terminals of the motor. Thus one-half, say the + half, of the alternate current would go through the motor, reinforcing the current of the battery, and bring the motor to speed in the predetermined direction; while the other half, or the — half, of the alternate current would pass through the battery.

A further device contemplated—by means of a governor that should act when the motor was thus brought to its speed—to simultaneously cut out the battery, shunt the whole alternating current into the field magnets and short-circuit the brushes; thus while at speed converting it into an alternating current motor.

I also drew a rough diagram of a dozen storage batteries and one primary cell connected up in a circle in series, connected in an alternating circuit, the points of connection being any two ends of a diameter of the circle, as at the first and seventh secondary cells. This, I believed, if precautions against short circuiting on cessation of current from the alternator were taken, would enable storage batteries to be charged by the alternating current.

These crude deductions of mine came to me independent of Mr. Tesla, and in no wise detract from his well-earned fame, and are simply curious coincidences in scientific research.

C. H. Burleigh.

Boston, Mass.

The Massachusetts Electric Lighting Association.

In the organization of State Electrical Association, Massachusetts leads the country. The initial step which led to the consummation effected to-day (Nov. 7), was taken on the 21st of May, 1889, in this city, at which time a meeting was held composed of representatives of companies engaged in the business of electric lighting.

The committee raised at that meeting to consider the advisability of forming a State Association reported as follows:

"*We regard the formation of such an Association as desirable from every point of view; indeed, we regard it as necessary to the protection of our mutual interests.*"

Pursuant to a call issued by this committee, a meeting of representatives of central station companies was held at the Tremont House to-day (Nov. 7), for the purpose of effecting a State organization. About forty companies, representing fully $5,000,000 of capitalization, participated in the meeting. All systems of electric lighting are now operated daily by these companies; the arc and incandescent; the low pressure and the high pressure; the continuous and alternating currents. This shows that the organization is cosmopolitan.

A code of by-laws was adopted and the following officers were elected: F. A. Gilbert, president, Boston; T. C. Bates, vice-president, Worcester; G. W. Fifield, vice-president, Lowell. Executive committee: F. A. Gilbert, Boston; T. C. Bates, Worcester; G. W. Fifield, Lowell; C. L. Edgar, Boston; C. A. Nichols, Springfield.

The membership of the association is limited to general station companies doing an electric lighting and motor business for commercial purposes. Gas companies doing an electric lighting and motor business may become members, and a number of such companies were represented in the meeting.

The objects of the association are to "*foster and promote the common interests of its members.*" The by-laws provide for co-operation with similar Associations organized in other States, through the medium of a National Association, in such manner as may hereafter be considered desirable.

The Boston Electric Light Company extended a cordial invitation to all persons present to dine with its officers at the conclusion of the meeting. This invitation needed no repetition; every one's hearing seeming to be good, and all appeared to understand that an enjoyable entertainment would be found in the cosy Tremont House dining room, to which Mr. F. A. Gilbert led the way.

A movement is being made to organize State Electrical Associations in all States. The work is being assisted and developed under the auspices of the "National Committee on Legislation of the National Electric Light Association." The necessity for such organization is very clear to all who have given thought to the subject. All central station companies are incorporated under State laws. They occupy territory in which they do business by virtue of municipal franchise, the tenure of which is controlled by State legislation. Through State legislation they acquire all legal rights, and through State legislation all efforts to cripple or thwart their endeavors are made.

Had there been a properly organized electrical association in the State of New York, to look after proposed legislation, the laws requiring criminals to be executed by electricity, and creating a "Board of Electrical Control" in New York City, composed exclusively of politicians (no electrician in its membership), would never have made New York the electrical plague spot of the country. The damage already done to the electrical industry by these two laws is simply enormous. Such damage may be perpetuated if effective measures of prevention are not provided.

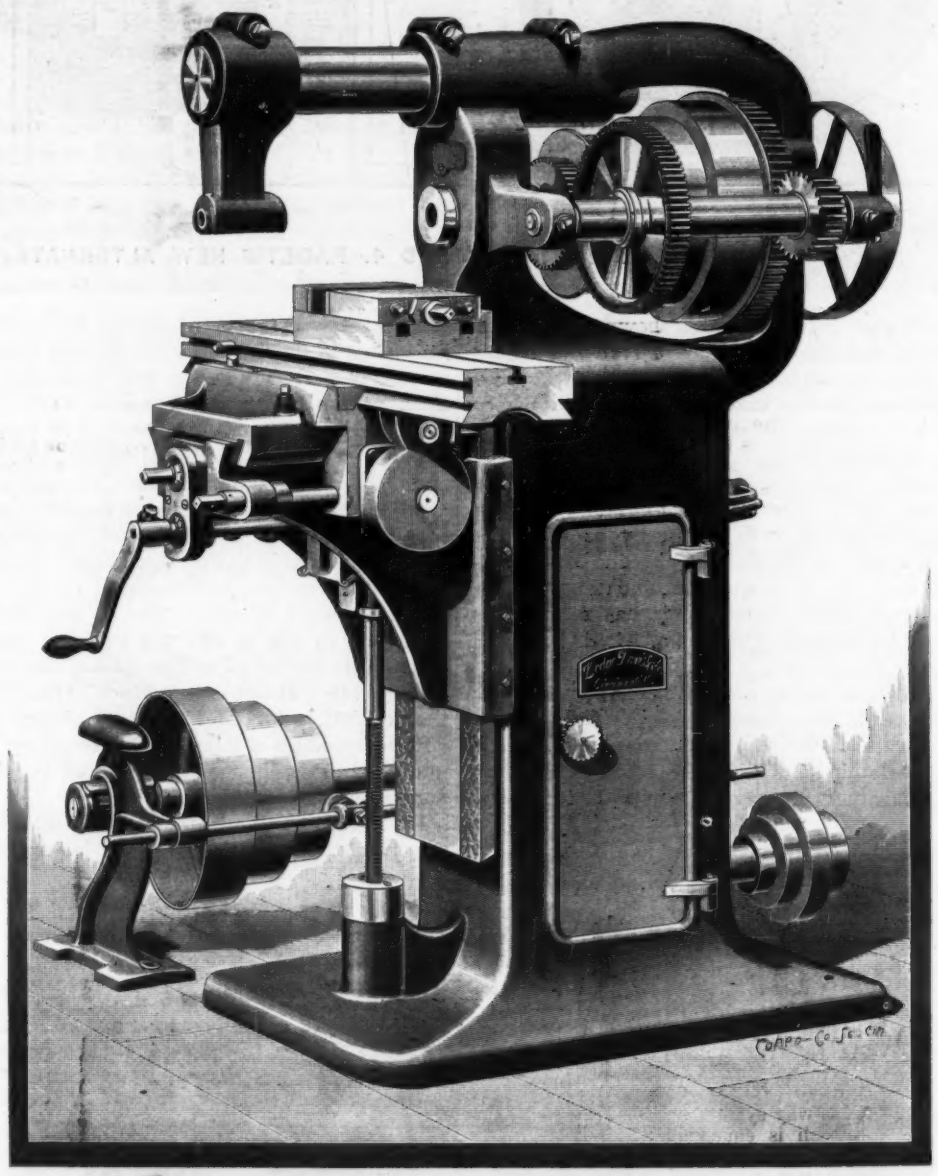
A. R. Foote, Chairman,
National Committee on State and Municipal Legislation of the National Electric Light Association.

Boston, Mass., Nov. 7, 1889.

Improved Milling Machine for Electrical Work.

One of the most convenient tools in a machine shop, and especially one engaged in electrical work, is the milling machine, an improved form of which has recently been brought out by the Lodge & Davis Machine Tool Company, of Cincinnati. This machine, which is illustrated in the accompanying engraving, is made in three styles, namely, plain, back-geared, and back-geared with universal head and index centres. The spindle bearings are tied together by an arch, which is cast solid with the uprights and column, and the front of which is bored to receive the overhanging arm for the outer centre support. This construction makes it easy to remove the arm when it is desired to do so, by simply loosening the two clamp bolts shown. The bearing of the arm in the arch is 12 inches in length.

The boxes are made in halves, of bronze, and instead of the usual flanges at each end, have a deep rib running around them in the centre of their length. This rib fits tightly into a groove which is formed in the column and box-cap, the groove being bored out in the columns and caps simultaneously by specially constructed tools. This makes a box which can easily be replaced by any one who has facilities for doing a good job of simple lathe work.



IMPROVED MILLING MACHINE FOR ELECTRICAL WORK.

Each box is adjusted by means of a screw of large diameter placed above the cap.

The table has a vertical movement of 15 inches and the top of the table can be raised to the height of the spindle centre. The saddle has a five-inch motion to and from the column, and it can be clamped solid to the knee by means of the screw shown at the right hand side of the saddle, thus obviating the necessity for disturbing the gib screws, and also being more convenient.

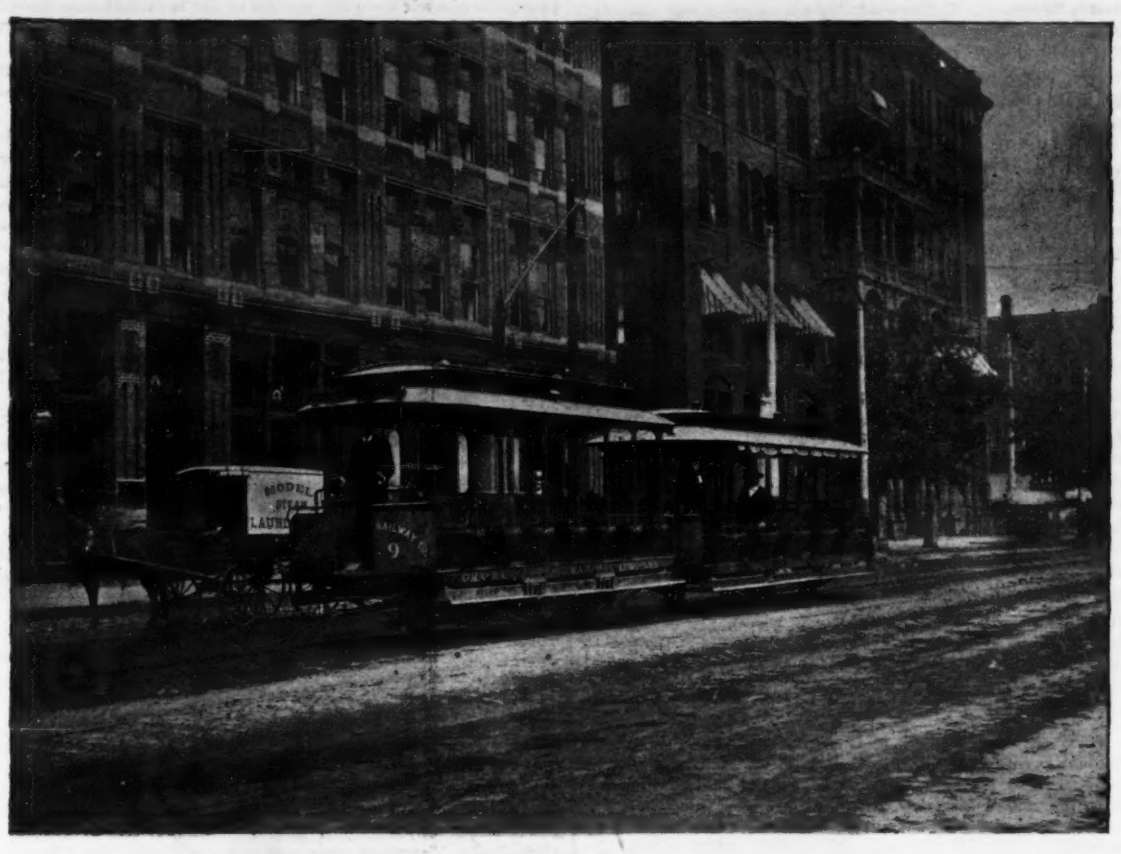
All three movements of the table are effected by the same hand crank which fits either of three squared shafts which are grouped together in a convenient place, and the crank handle can be clamped on them when desired.

Instead of the usual devices for the feed of the table, there is under it, and in the centre of the saddle, a bronze screw 12 inches long and 4 inches in diameter. The threads of this screw engage with spiral teeth which are hobbed out in the bottom of the table, and extend along it from end to end. By this means a strong feed mechanism is obtained, and the thrust is brought as close to the top of the table as possible. The train of gears for revolving this screw, and thus feeding the table by hand, is distinct and separate from the train used for power feeding, and, when moving the table by hand, one revolution of the crank gives a movement of just one inch to the table. This construction admits of a table of any desired length with a feed the entire length of it, and it can be taken out at either side of the saddle without removing or disturbing any other part. The table is 6¼ inches wide and 32 inches long.

The machine illustrated is driven by a three inch belt, the largest step of the pulley being 11 inches in diameter. The plain machine without back gears is driven by a 3½ inch belt, the largest step being 13 inches in diameter. The weight of the machine is 2,000 pounds.

The Omaha Motor Railway.

The Omaha Motor Railway, at Omaha, Neb., which is shown in the accompanying cut, is one of the largest and most important electric railways in the west. Seven miles and a half of track was the original electrical equipment, but the satisfactory operation of the cars resulted in an extension being made very soon after the first car was put in operation. In constructing the overhead line the cross suspension method was used, the conductor being supported from cross wires attached to poles placed at the curb line a distance of 120 feet apart. The track is laid with Johnson girder rail, with some exceptions in the outlying districts where the streets are as yet not paved; in these places T-rail is employed. All the rails are reinforced at the joints by copper wires, insuring a perfect path for the return current. The line comprises many grades and curves, the former ranging from 3 to 9 per cent., and the latter being from 60 to 75 foot radius.



ELECTRIC CARS ON THE OMAHA MOTOR RAILWAY.

The power station is a two-story brick building, with a small car-house attached. The upper story is used for offices, store rooms and repair shop, and the lower story contains the steam and electrical apparatus. The building is lighted by seventy 16 c. p. lamps, the current being supplied from the same generator that furnishes current for the cars. The electrical plant consists of eight 80 h. p. Thomson-Houston generators, connected to a switch-board provided with all the most improved appliances necessary for the manipulation of the current. The steam plant consists of two Corliss engines of 200 and 400 h. p., respectively, connected to a line of shafting provided with friction clutch pulleys, which renders each generator independent of the others. The boiler room contains six 100 h. p. boilers, steam pumps, heater and other necessary appliances.

The cars, which were built by the Pullman Company, are 26 in number and are each equipped with two 15 h. p. motors. The average car run is 18 hours per day, and the average number of tow car trains per day is 23. There are three car houses capable of holding 100 cars, located at convenient places along the line. Each is provided with suitable pits between the tracks so that the cars can be cleaned and all necessary repairs readily made, while to facilitate shifting a trolley wire is placed over each track.

The Omaha Motor Railway system comprises 40 miles of track, about 26 of which is equipped electrically. The traffic since the electric cars were used has been very heavy indeed, and the performance of the apparatus under severe tests with heavy loads has been all that could be asked. The electrical equipment will be extended as rapidly as possible until the entire system can be operated without the use of horses.

The Storage Battery Situation.

It has been a matter of general regret, on the part both of the public and of electricians, that the Julien storage battery cars on the Fourth avenue road ceased from running, when the Lacombe decision was given as to the use of "pasted" plates. It is now understood that the service will be resumed at a very early date, the Julien Company being now busily engaged in the manufacture of "dry powder" plates, by pressure, which will be used on the cars in question. The Julien Company state that it is a relief to them to learn now just what the Court wants, and that in meeting the terms of the latest decision they flatter themselves that they will be able to produce a battery superior to anything that they have yet obtained from their experimentation and practical work. The dry powder plates shown by the Julien Company are certainly very creditable specimens, and look capable of sustaining a very severe ordeal. It has been rumored, in this connection, that an agreement or contract exists between the Julien and Brush storage battery interests, whereby, under the Brush patents controling broadly the mechanical application of the active material, the Julien Company would be masters of the situation. When interrogated last week in regard to these rumors, Mr. W. Bracken said:

"Some two years and a half ago, the Brush Electric Company, of Cleveland, sued the Julien Electric Company for an infringement, under the Brush patent No. 337,298, and other patents. It will be remembered that this is the patent over which so long a fight was had in the Patent Office between the Faure and the Brush interests, lasting from 1881 until 1886, and at an enormous expense. The Patent Office, in 1886, awarded Mr. Brush the priority of invention to the *mechanical* application of the active matter in any form to a support plate, and on March 2 of that year issued the above patent to Charles F. Brush. The argument in this case, that is Brush against Julien, was made before Judge Coxe, in the United States Circuit Court, week before last, and a decision is awaited with great interest, for the reason that the Brush patent covers the broad principle of mechanical application to the support plate, no matter in what form. Not only that, but it covers the invention of receptacles or perforations in the support plate. It will be remembered that in the suit with the Accumulator Company, the Julien people had a Swan patent for a perforated plate adjudged invalid by Judge Coxe, but unfortunately for those using perforated plates, or grids, or support plates with receptacles, Mr. Brush's patent goes back of Mr. Swan's. It is thought by those patent lawyers best capable of judging in the matter that the broad claim of mechanical application, as well as the claim for the perforated plate of the support plate with receptacles will be sustained."

Mr. Bracken refused, however, to either confirm or deny the rumor as to his company's favorable situation, in this view of the case. He said: "The natural consequence of the decision would be that while those owning the Faure patent have the exclusive right to the use of paste, yet they cannot apply the paste mechanically to the plate without a license from Mr. Brush, or his licensees, who might, as these rumors say, be ourselves. As the Brush patent has fourteen years to run the monopoly thus constituted would be a rather extensive and valuable one."

Electricity at the Washington Marine Conference.

Those in attendance at the Marine Conference at Washington who have expected an influx of electrical devices designed to prevent collision at sea with other vessels and with masses of ice have thus far been disappointed. Doubtless before the conference adjourns different types of search lights will be presented for approval, but thus far the only electric element of the model display at the Wallach House, where the conference is in session, is a fine model of the U. S. S. "Kearsarge," on which are arranged a number of white and colored miniature incandescent lamps, to be used in illustrating the various changes in ships' running lights that have been proposed and discussed.

These little lamps are run from storage batteries furnished by the Electrical Accumulator Co., of New York City, and are very pretty.

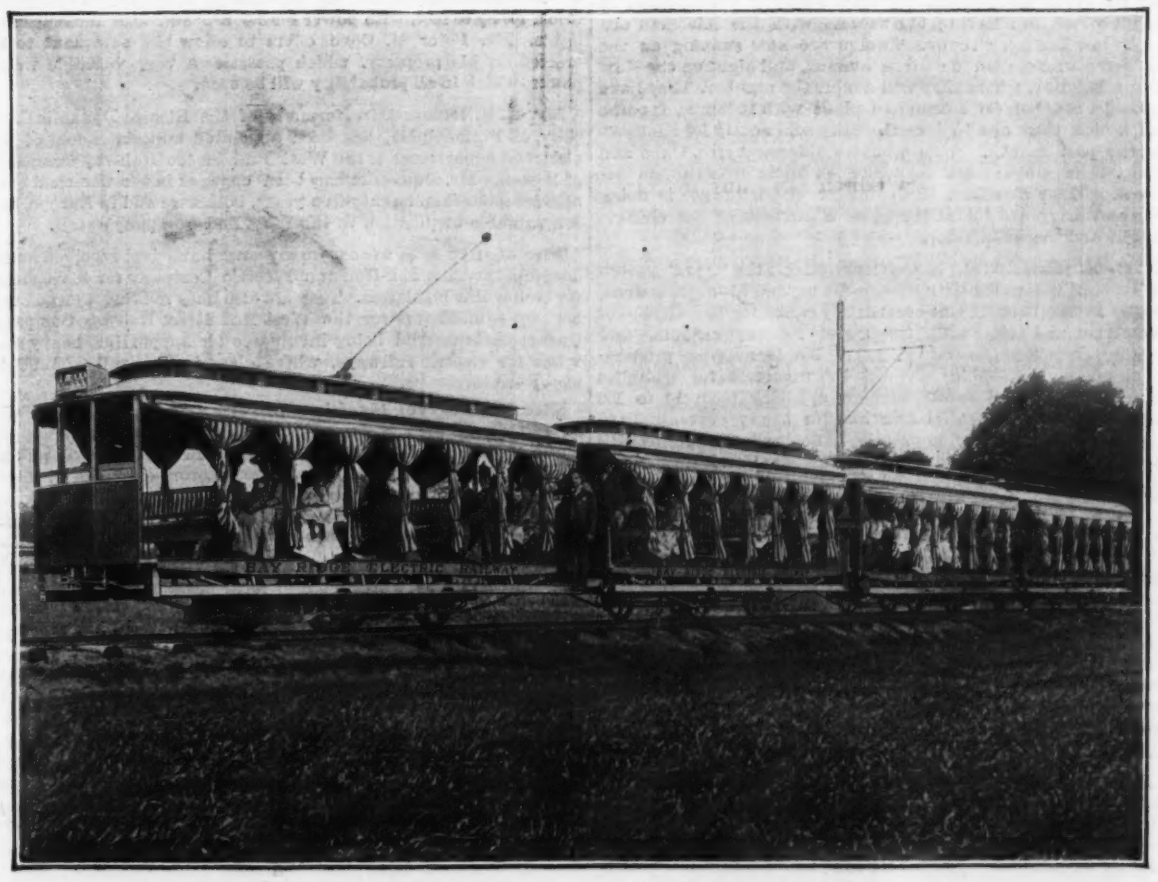
One of the proposed innovations in lights is to have two green and two red side lights, the forward of which are visible from dead ahead to two points abaft the beam, and the after light from three points off either bow to two points abaft the beam. It will be understood that when only the single side lights are in sight the vessel is approaching nearly end on, but when both lights are in sight (both green or both red) the vessel's course is more than three points from the line of sight. Although this is ingenious, it is believed to be too complicated to be adopted. The method which will no doubt be approved is one using the ordinary single side lights, and in addition to the masthead light now carried by seagoing steamers, to have another white light at the main royal masthead; this might have to be rigged with two jack stays and be inconvenient to send aloft, but its efficacy would be far greater than any system of double side lights. Where a ship is supplied with her own lighting plant these lights can be kept standing, and all inconvenience of rigging double halyards and jack stays is overcome.

The various electric buoys and other devices alluded to in the papers, have as yet been brought to the attention of the conference only by correspondence. Inventors of every kind of apparatus have facilities for now bringing their devices before the conference, and many new and original ones will no doubt appear. F. R. C.

The Sprague Road at Bay Ridge, Md.

The accompanying cut shows one Sprague electric car and three trail cars in operation on the Bay Ridge, Md., Electric Railway. This road was installed during the spring of 1889, and has carried during the summer large crowds of passengers who have visited that popular seaside resort on the Chesapeake Bay, near Baltimore.

Each electric car upon the line is equipped with two Sprague, type No. 6, improved electric motors, and the regular average load during the past season has been its own full carload of passengers and one tow car, similarly loaded. The photograph from which our engraving is taken shows a test which was successfully made, of forcing one electric car to tow three loaded tow cars, or three times the usual number of cars. While it is not advisable to overload electric motors, yet, very often, when circumstances compel it, the motors can be relied upon to do more than their normal amount of work without any harmful results.



THE SPRAGUE ELECTRIC ROAD, BAY RIDGE, MD.

The management of this road have expressed themselves as being perfectly satisfied with their electrical equipment. The president of the railway company, Mr. Henry Wellington, of New York City, is reported as stating that the running of the road is attended with the most pleasant and satisfactory results, and that it has been in daily operation without the least cause of delay, since its installation. Such results as these go far toward strengthening the already wide-spread feeling of confidence which street railway managers feel in their electrical equipments, and toward extending the use of electric roads throughout the country.

Special Correspondence.

NEW YORK NOTES.

Office of The Electrical World,
167-177 Times Building, New York, Nov. 11, 1889.

A. A. McCreary, 18 Cortlandt street, shipped 300 silvered standard reflectors to London last week, and a large order to Southern countries. The demand for his new revolvable half shade for incandescent lamps is keeping him hustling. He has been fitting one of the cruisers with his shades and portables.

C. McIntire & Co., of Newark, N. J., report that they are now filling an order of 50,000 connectors, terminals, tees, etc., for underground work, and hard-drawn wire; also large orders for No. 6 terminals, and for cord terminals, connectors for large cables (underground work) as large as 8—0 B. & S. They also have orders for branch connectors for incandescent work, and connectors for dynamos, etc. They are now working day and night filling orders. On Jan. 1 they move to larger works.

The Sawyer-Man Electric Company is running its lamp factory at 510-534 West 23d street, this city, day and night, constantly, and reports being 100,000 lamps behind its orders. The demand is so great that the Sawyer-Man Company, in the interests of its customers, is endeavoring to impress on them the advisability of anticipating requirements in the way of lamps at least a couple of weeks. At the present time extensive additions are being made to the factory, and when the new pump room is completed there will be nearly 900 pumps in use.

Mr. Peter Claus, manager of the Continental Dynamo Company, 42 Exchange place, has secured the lighting of the Cotton Exchange with six hundred 16 c. p. lamps. The Harlem Opera House takes two 600 light machines, and the Delavergne Refrigerating Company a plant of 2,500 incandescents and 40 arcs. Mr. Claus sold over 2,000 lights last month. They have purchased land in Jersey, 200 by 100 feet, and will put up a three story building for manufacturing their apparatus. They want two 100 h. p. boilers and four high-speed engines.

The Easton Electric Company, of 45 Broadway, have issued a very neat and interesting pamphlet relating to the system of arc and incandescent lighting, worked out by their electrician, Mr. A. W. Easton. This system, as the "Reliance," has met with great success in Canada, and is now bidding for favor in this country. Among the many claims made for it are those of cheap first cost of installation, simplicity and durability, and high economy in operation. Mr. P. Minturn Smith is president of the company; Mr. W. D. Perry, vice-president; Mr. G. G. Frelinghuysen, secretary, and Mr. C. Tremaine, treasurer. The pamphlet includes a number of testimonials and a partial list of plants installed by the company.

W. H. Gordon & Co. have opened an office in the Boreel Building, 115 Broadway, for the sale of electric light and power specialties, a catalogue of which they have now in press. They aim to handle goods and appliances of acknowledged merit only, and to keep abreast of the times in placing on the market the latest inventions and devices of practical usefulness. They are, they believe, the only house in New York making a specialty of electric light and power appliances, and their already large correspondence is an augury of the success of their enterprise. There is no reason to doubt that a large and profitable business awaits a concern making fine instruments and fine work its main objects of attention and study.

The Electric Construction and Supply Company, 18 Cortlandt street, are having big success with the Kinsman arc lamps for low tension circuits. Twelve are now running on the Edison three-wire system on Sixth avenue, and eight on the New York *Sun* building, where they will double the number. They have just closed a contract for a complete plant with 12 lamps, dynamo and all, which they are to install. They sold nearly 100 Kinsman lamps the past month. Some went to Buenos Ayres, Cuba and Colorado. The company are very busy in their construction department. Their Standard thermometer department is doing nicely, and they are installing quite a number of the electric telemeters and thermometers.

Mr. C. S. Van Nuis, 18 Cortlandt street, the "Ajax" switch manufacturer, is meeting with success far beyond his expectations, especially in small sizes. One order lately called for 50 switches of 200 ampères and 500 volts for street railway circuits, and the same company ordered 16 more. He is making preparations as fast as possible to meet the demand for switches of high potential and small ampère capacity from 10 to 100 ampères. The high potential switches for heavy currents up to 1,000 ampères are coming so greatly in demand that it necessitates special manufacturing arrangements. Mr. Van Nuis is filling orders as fast as he can with his present facilities.

Dr. S. S. Wheeler, of Crocker & Wheeler, 322-324 Seventh avenue, manufacturing electricians, showed me last week a small motor coupled up to a triple-cylinder Gould pump. The motor is set on top of the pump. It was started to show me what could be done with this combination. A regulating valve was put in the outlet pipe from the pump, and from the tests Mr. Wheeler estimated he could carry water 300 feet high with a current of 10 ampères and an electromotive force of 16 volts. He has just completed the first large motor of their new type, and is waiting for a larger pump to test it. The automatic governor on these motors, which draws the armature out of the field of force while running at any speed or power, is creating a great stir in electrical circles.

C. & C. Motor Company.—I called in last week at the C. & C. Motor Company's salesrooms, 402-404 Greenwich street, and met Mr. Lufkin, who had just returned from a trip to California. He brought back a couple of nice orders for mining plants, amounting to 110 h. p., and also recovered his old-time activity and good health. He took me through their works, with six floors, 51 × 91 feet each. On the first floor they were testing motors of 3, 5 and 10 h. p. for the Auditorium at Chicago. I was principally attracted to a large Sturtevant blower, with a newly connected C. & C. Motor of 2 h. p., and capable of delivering 20,000 cubic feet of air per minute. This is to go on the U. S. cruiser "Baltimore." Mr. Lufkin showed me through the other floors, containing over one hundred varieties of machines, presses, stamping presses, planers, milling machines, some of which are very heavy, such as a 12-foot long Pond planer, a Newark Tool & Machine Company's horizontal drilling and boring machine weighing about six tons; E. E. Garvin's milling and drilling machine, all of which they speak of in the highest terms. They have a 12 x 12 Ball engine of 80 h. p., running two Edison dynamos. The No. 20 is wound for 220 volts and the No. 16 is wound for 110 volts. They also have their factory and salesrooms fitted with 500 16 c. p., lamps used daily. All these lamps are run from the same generators. Circuits are run separately to each floor from the generators furnishing current to their own motors, which are attached to the above machines.

W. T. H.

NEW ENGLAND NOTES.

Branch Office of The Electrical World,
Room 8, Cook Building, cor. Franklin and Congress Sts.
Boston, Nov. 9, 1889.

Bristol, N. H., has set the ball rolling toward having an electric light plant by subscribing $5,000.

Mr. Levi Cofren has been presented by his numerous friends in Boston with a very handsome umbrella, which is now on view at the Sherman House in this city.

Adams, Mass.—L. L. Brown & Co. are considering the advisability of transmitting power electrically from a waterfall about a mile away from their mills.

The Marr Construction Company have just closed the contract with the South Berwick and Salmon Falls Electric Light Company, to erect and equip their new Westinghouse central station. Seven hundred lights will be provided for at present.

Mr. D. A. Andrews, Jr., of Pettingell, Andrews & Co., has just started on an extensive trip throughout the South. Mr. Andrews will take in Baltimore, Washington and all large cities as far south as New Orleans, and will return by way of Kansas City and Chicago.

The Boston Electric Club will give a dinner at the Boston Tavern on Tuesday evening, to which all members and friends are invited. The occasion promises to be enjoyable, interesting and instructive, as an informal discussion on some of the interesting electric topics of the day will follow the dinner.

The Wright Electrical Engineering Company, of Boston, have set one of their line gangs to work running wire for feeders for the West End Street Railway Company, of Boston. This company has also a gang of men at work on the incandescent wiring in the temporary power station on Albany street.

Mr. F. T. G. Hill, formerly electrician of the Waltham, Mass., Gas and Electric Light Company, has returned there to take full charge of the plant. For the past eighteen months Mr. Hill has been connected with the construction department of the Thomson Houston Company, most of his time having been spent at Dedham, Mass.

Boston to Salem.—Some capitalists of Boston are considering a scheme for building an electric railroad from Boston to Salem, a distance of seventeen miles. Should the road be built it will bring into direct competition on a large scale the electric and the steam railroad, the outcome of which will be watched with much interest.

Mr. I. H. Prentiss, one of the Brush experts, visited New England last week and accompanied Mr. L. H. Rogers to Dexter, Me., and Haverhill, Mass., in order to inspect the ground and oversee the installation of the new Brush alternators in these cities. Mr. Prentiss is guaranteed plenty of this work in New England by Mr. Rogers.

The Thomson-Houston Electric Company reports the following sales of incandescent apparatus to local companies: Van Wort, O., 300; South Pittsburgh, Tenn., 300; Columbia, S. C., 500; Mt. Vernon, N. Y., 1,300; Cincinnati, O., 1,300; Salem, Mass., 650; Mt. Vernon, Ind., 650; Hudson, Mass., 650; Lancaster, N. H., 650; Turner's Falls, Mass., 650.

Mr. C. R. Fish, formerly manager of the Narragansett Electric Light Company, at Narragansett Pier, has just been appointed general manager of the Woonsocket Gas Company. Mr. Fish has been connected with the Thomson-Houston Company for several years, and has had a large practical experience, which will be of great service to him in his new sphere.

Taunton, Mass.—The Taunton Electric Lighting Company are considering plans for the erection of a station to be built of brick, 100 by 60 feet, with power for 300 arc and 2,000 incandescent lights. Mr. Peter H. Cove offers to allow the new plant to be erected on his property, which possesses a very valuable water power, which in all probability will be used.

Mr. L. S. Dumoulin, formerly of the Electro-Dynamic Company, of Philadelphia, has been appointed superintendent of the electrical department of the West End Street Railway Company, of Boston. Mr. Dumoulin has been engaged in the electrical business for more than twenty-five years, both here and in Europe, and is a valuable acquisition to the West End Company's staff.

The Gould & Watson Company have just received an order from the Thomson-Houston Electric Company for 18,000 pieces for trolley line insulators. They are also busy making a large number of pole insulators for the West End Street Railway Company, their special material being invaluable for supporting heavy feed wires for electric railways, where glass is too frail to stand the heavy strain.

The Falls Rivet Machine Company, of Cayuhoga Falls, N. Y., through their Boston agency, have been busy lately supplying to the electrical trade their specialties in steel rimmed pulleys with cast-iron spiders, which they manufacture exclusively. These pulleys are meeting with great favor as being extremely strong and at the same time extremely light compared with pulleys which are made entirely of cast iron.

The Thomson-Houston Electric Company reports the following sales of arc apparatus to local companies: Mt. Vernon, Ind., 50; New Philadelphia, O., 100; Spokane Falls, W. T., 50; Seattle, W. T., 100; Stonington, Conn., 30; Salem, O., 30; Birmingham, Ala., 50; Mt. Vernon, N. Y., 100; Middletown, N. Y., 50; Tuscaloosa, Ala., 50; Columbus, O., 100; Upper Sandusky, O., 50; Somerville, Mass., 200; Oshkosh Electric Light and Power Company, Oshkosh, Wis., 30.

Standard Electric Company of Vermont report the following sales this week: Burley & Usher, Melton, N. H., 200 light plant; The A. & E. Mudge Shoe Company, Springvale, Me., 600 light plant; Burley & Usher, Newburyport, Mass., 200 light plant; Isaac Prouty & Co., Spencer, Mass., 1,000 light plant; Burley & Usher, Springvale, Me., 200 light plant; Woodbury Brothers, Beverly, Mass., 150 light plant; Kennebec Fibre Company, Benton, Me., 150 light plant.

Mr. L. H. Rogers, the New England representative of the Brush Electric Company, has sold a Brush alternating dynamo to the Woonsocket, R. I., Gas Company. The capacity of the machine is 600 lights, and it will be installed at once. From the numerous sales that Mr. Rogers is reporting of these new machines, one is led to suppose that the Brush alternator is either a "world beater," or that Mr. Rogers is a lightning salesman. Probably the truth is composed of a little of both facts.

Telephone vs. Electric Railway.—At Young's Hotel, Boston, evidence was given this week to be used in the suit now pending between the telephone company, of Cincinnati, and the Sprague electric railway in the same city. Mr. S. D. Greene, electrician of the Sprague Company, and Mr. Farnham, electrician of the New England Telephone Company, testified. Further testimony will be taken in Washington and Richmond, and the case is expected to come up for trial in Cincinnati about Dec. 1.

Electric Gas Lighting Company.—Mr. Burnham, son of Colonel Burnham, general manager of the Electric Gas Lighting Company, has started out on an extensive trip throughout the West, and is at present in Michigan, whence he continues to send in numerous orders. Mr. Burnham has been out of the electrical business for a year or two, but now returns to his old love with renewed vigor, and is metaphorically raking the Western territory with a fine-toothed comb for orders for electrical goods.

Mr. P. H. Alexander, who is so widely known as the general manager of the Sawyer-Man Company, and who was appointed last June to the position of general manager of the New England branch of the Westinghouse Electric Company, has reason to congratulate himself upon the success of the Westinghouse business in New England during the six months since he took hold of this end of the line. Mr. Alexander is an indefatigable worker and a skillful organizer, and did much to raise the Sawyer-Man business to the pinnacle of success, which it occupies to-day. He bids fair now to repeat his success with electric light business throughout New England.

Mr. H. B. Cram for many years general manager of the Bernstein Electaic Company, will, I feel sure, receive the congratulations of his numerous friends from all over the country, on the occasion of his approaching marriage, which takes place on the 21st of this month. No gentleman in Boston is better known to the electrical fraternity, or has a larger circle of friends than Mr. Cram, and his honest efforts in the interests of the Electric Club, and more recently in the New England Electric Exchange, have endeared him to all. Mr. Cram marries a very estimable lady of Boston, and will start his housekeeping experience in Cambridge. He will be at home to his friends after Dec. 3. May continued good luck and long life and happiness attend him.

The Redding Electric Company are extremely busy just now manufacturing their many speciaities, and have recently shipped a very large consignment of their general electric supplies to Buenos Ayres. Business is also extremely brisk in supplying the increasing demand for their clocks, which are fitted with an electric watchman's time register. This is the *only* register in the market which gives a plain printed record from the various stations throughout a factory or building, instead of the usual method of punching small holes. The small levers, which are actuated by electro-magnets, electrically connected with these stations, are each mounted with type, which strike on the paper dial. Between the type and the dial is an inked tape, and each morning a printed record remains on file, indelibly showing whether the watchman did his duty or not.

Isolated Plants.—The Thomson-Houston Electric Company reports the following sales of arc and incandescent apparatus for isolated plants: Philadelphia & Reading Railroad, Reading, Pa., 20 arc; O'Donnell, Spencer & Co., East Saginaw, Mich., 200 inc.; Carnegie, Phipps & Co., Munhall, Pa., 70 arc; Washington Mills, Lawrence, Mass., 50 arc; E. Mansfield & Co., Orino, Me., 35 inc.; Aber Joyle Manufacturing Company, Chester, Pa., 50 arc; H. Twitchell, Union City, Conn., 50 inc.; Syracuse Steam Heat and Power Company, Syracuse, N. Y., 50 arc; Wineman Bros., Upton Station, Tenn., 50 inc.; Crandall Typewriter Works, Parish, N. Y., 50 inc.; Henry Newhall, Danvers, Mass., 50 inc.; Bradley Leather Fabric Company, Reading, Mass., 50 inc.; J. S. Crane, Lake Village, N. H., 100 inc.; Day Cordage Company, East Cambridge, Mass., 50 inc.; Hockanun Company, Rockville, Conn., 100 inc.; V. K. & A. H. Jones, Lynn, Mass., 200 inc.; A. N. Wilson, Watertown, Conn., 200 inc; Searle, Dailey & Co., Medfield, Mass., 600 inc.

A. C. S.

WESTERN NOTES.

Branch Office of The Electrical World,
39 Mallers Building, Chicago, Nov. 9, 1889.

The National Card Company, of Indianapolis, are having a 225-light Edison plant installed in their factory.

Mr. J. H. Branch, of Marengo, Iowa, has contracted with Mr. E. E Keller for the construction of his entire plant.

Mr. E. H. Wells, of the Keystone Construction Company, Pittsburgh, spent two days in Chicago this week while en route West.

Murphy, Wasey & Co., of Omaha, have purchased a 150-light Excelsior Electric Company's incandescent plant of Mr. R. J. Randolph.

Pittsburgh, Pa., is agitating the question of having all the wires placed underground before April 1, 1891. Wonder if there will be an April fool surprise for the promoters of the scheme?

Paul Winsor, superintendent of the Keystone Construction Company, is temporarily in the city, en route East from Stirling, Ill., where he has installed a handsome Westinghouse incandescent plant.

President G. C. Kinsman, of the Association of Railway Telegraph Superintendents, stopped over in Chicago en route from Washington to Decatur, Ill., and paid an enjoyable visit to Mr. Knapp.

The Duquoin Light, Heat and Power Company, Illinois, has been organized to furnish light, heat and power; capital stock, $50,000; incorporators, J. R. Trusdale, D. Sheppard and R. M. Foster.

Mr. J. H. Shay, the expert electrician of the Chas. Munson Belting Company, Chicago, has recently sold 80 feet of 36-inch leather belting and 165 feet of 12-inch leather belting to E. R. Gilman, of St. Paul.

Mr. D. A. Andrews, Jr., of Pettingell, Andrews & Co., Boston, is gradually approaching the West on a trip that has proved very profitable thus far. Mr. Andrews will be cordially welcomed in this territory.

The Des Moines Electric Club is about to be organized by members of the electrical fraternity in that city. Among the workers being Joseph Deemer, L. G. Nilson, J. A. Colby, Edward G. Pratt and others.

Banker D. A. Ranck, of Fremont, O., was a welcome visitor at the club rooms during the week. Mr. Ranck is profitably operating a Thomson-Houston plant that has steadily grown in size since the first light was started.

Mr. Paul Bossart, of Kansas City, has secured the contract for installing 30 arc and 500 incandescent lights of the Western Electric system, and a complete installation of Electrical Accumulator cells in Manhattan, Kan.

The Hill Clutch Works, Cleveland, have secured the contract for an extensive addition to the Jenney Electric Light and Power Company's station at Fort Wayne, Ind., including several large sheave wheels for rope transmission.

The Vulcan Iron Works, Chicago, are making a specialty of aluminum brass and bronze castings for electrical apparatus. They have already made several castings of phosphor bronze and also silicon bronze, for electrical companies.

Mr. E. J. Martin, of Decatur, Ill., has been in the city for several days, transacting business in connection with the extension of

his electrical railway system. Mr. Martin is also operating a Slattery alternating incandescent plant for commercial lighting.

The Knapp Electrical Works, Chicago, have just received a carload of Grimshaw white core wires of various sizes, and report their ability to fil orders for any desired quantity. They have also secured a stock of several thousand Perkins lamps of various voltages.

The Eau Claire City Railway Company, employing the Sprague system, commenced the operation of its line by electric power on Oct. 31. The last span of mules was sold to the Marinette (Wis.) Street Railway Company, who will soon pass them on to somebody else.

Mr. W. J. Buckley, manager of the Chicago office of the Fort Wayne Electric Company, has just received a 1,000 light alternating Slattery dynamo and exciter for the Central Illuminating Company. Five more dynamos of the same capacity will be quickly placed in position.

Mr. J. W. Taylor, manager of the Chicago office of the Standard Carbon Company, of Cleveland has returned from an extensive trip throughout the entire West and along the Pacific slope. Mr. Taylor secured orders amounting in the aggregate to many hundred thousand carbons.

Capt. C. F. Dunderdale, of Chicago, has lately closed a contract for a 50 arc light plant of the Waterhouse system with the Seymour Gas Light Company, of Seymour, Ind., for street lighting; also with the city of Columbus, Ind., for a 70 arc light Waterhouse plant for street lighting.

The Chicago "Evening Journal" have been modernizing their office building, and among other improvements have added an Excelsior electric incandescent plant of two hundred and twenty-five 16 c. p. lamps that will furnish ample light for all the occupants, and for the editorials also.

Theodore Plate, head of the Interstate Gas and Water Works Company, telegraphed from Durango, Mexico, that he had been granted the franchise for the public lighting of that city for 20 years, with incandescent lights. Together with the private lighting about 2,000 lamps will be required.

Foree Bain, Chicago, has just returned from the first vacation taken in ten years, having been hunting "coons" in Kentucky. He reports having doubled his capacity and floor space, and installed some $2,000 worth of new machinery. Mr. Bain's services are in constant demand for expert work.

The Chicago Arc Light and Power Company have purchased the lighting plant operated by the Columbia Skating Rink Company, and have moved it to their station near the corner of Chicago and Milwaukee avenues, making a total of 100 lamps now in circuit and operated from that station.

Mr. E. E. Keller, manager of the Chicago office of the Keystone Construction Company, has secured contracts for the installation of the Westinghouse alternating incandescent plant for the Lincoln Water and Electric Light Company. Over one thousand 40-foot poles will be used in this contract.

The Lane & Bodley Corliss Engine, of 150 h. p., to be placed in the new Thomson-Houston lighting station, at Joliet, as well as the three 100 h. p. boilers, etc., will all be installed by the Pond Engineering Company, of St. Louis, who are also supplying four 90-h. p. boilers to the San Diego, Cal., Cable Railway.

Mr. W. J. Clark, of America, dropped into the Chicago office of the Thomson-Houston Electric Company, while returning from a flying trip over the mountains to the Pacific slope. Mr. Clark states that should certain legislation be enacted in California several electrical railways will be installed at once.

The Central Electric Company, Chicago, are adding a full line of toy motors, Ruhmkorff coils, Geissler tubes, plunge batteries, etc., for students' use, and for the entertainment of the younger members of the family during the long winter evenings. They have also secured the agency for Tuttle's patent telephone rest.

Thos. G. Grier, of the Marr Construction Company, reports securing a contract from C. T. Sykes, of Minneapolis, for the installation of 35 Waterhouse arc lights and 500 Westinghouse alternating incandescent lights. Fifteen thousand pounds of Standard Underground Company's wire will be used in this installation.

Electric Club Notes.—The regular Monday evening meeting of the club was called for last Monday evening, but as only nine members had gathered at 8:30 P. M. an adjournment took place. Paul Bossart, of Kansas City, and Stetson Leach, of Denver, Col., were entertained at the rooms by Myron A. Knapp on Tuesday last.

Decatur, Ill., is already reaping the reward of progressive action, as a new factory employing a large number of hands is to be established in the outskirts of the city. It is said that the selection of Decatur for the location of the factory was made mainly on account of the excellent facilities afforded in the matter of local rapid transit by electricity.

Mr. F. S. Terry, manager of the Electrical Supply Company, Chicago, has returned from a somewhat extended business trip in the East, and reports prospects as appearing unusually bright. Mr. Terry's return will enable his able assistant manager, Mr. William Taylor, to devote his entire time to his two idols, one of which is "Shield wire."

Electrical Transit for Nashville.—A press dispatch from Nashville, Tenn., of Oct. 29, says: "A deal was consummated yesterday by which all the street railway lines in the city will be consolidated under one management, the capital stock being about $3,000,000. About fifty miles of road are included in the deal. All the lines will be operated by electricity."

The Sperry Electric Company, Chicago, report the sale of 40 Sperry arc lights to the Kaufman Clothing Company, Pittsburgh; 40 arc lights to the Edison Illuminating Company, Hazelton, Pa.; 40 arc lights to the South Bend, Ind., Electric Company; 20 arc lights to the Wells French Car Works, Chicago; and 80 arc lights to the Edison Electric Illuminating Company, Birmingham, Ala.

Mr. John J. Nate, the purchasing agent of the Chicago Telephone Company, who has been using the "Disque" battery made by the Western Electric Company of Chicago, on account of the long life of the porous cup, which is duly entered on a register devised by Mr. Nate for that purpose, is about to settle the question whether it will prove economical to rejuvenate the porous cups after their life is apparently exhausted. This experiment will be carried out on a very large scale and in a thorough manner.

Telephone Quotations.—Col. S. G. Lynch, broker, 146 La Salle street, Chicago, furnishes quotations on telephone stocks as follows:

Chicago	$305@$310	Cumberland	$ 69@ 70
Central Union	58@ 59	Wisconsin	114@ 115
Michigan	87@ 88	Bell of Missouri	150@ 151
Great Southern	32@ 33	Iowa Union	23@ 25
Colorado	36@ 38	Missouri and Kansas	57@ 58
Rocky Mountain Bell	40@ 41		

ELECTRIC LIGHT STOCKS.

Chicago Arc Light and Power	$ 70@$ 73	Chicago Edison Co	$ 98@$100

F. DE L.

THE TELEGRAPH.

The New Western Union Cables.—The steamship "Faraday" has been busy the past two weeks laying the two new Western Union cables between Coney Island and Canso.

Telegrams on Trains.—Speaking of advancement in telegraphy, the *Railroad Gazette* says: "The train telegraph, for conveying messages to and from moving trains, seems to have made much progress of late; but the Pennsylvania has put in use a scheme which is next door to it, in arranging for the publication of quotations from the New York and Philadelphia stock exchanges in the cars of the New York and Chicago limited. Reports are delivered to the trains at Philadelphia, Harrisburg and Altoona."

THE TELEPHONE.

Denver, Col.—The telephone exchange has been visited by fire, and the damage is reported as serious.

Erie Dividends.—The Erie Telegraph and Telephone Company announces that a quarterly dividend of one per cent. will be paid to stockholders Nov. 11, 1889. The following statement for the quarter ended Sept. 30 is made: Gross earnings, $178,526; gross expenses, $109,814; net earnings, $68,712; dividend, $48,000; construction (new), $10,098; net surplus for the quarter, $10,614. Subscribers connected July 1, 1889, 11,564; added during the quarter, 138.

Long Distance Telephony.—The New York *Morning Journal* of Nov. 3 says: "The Long Distance Telephone Company will by Jan. 1 have completed its lines from New York to Chicago, from Chicago to Denver, and from Denver to San Francisco. At the office of the company it was said yesterday that in less than two years from now the Bell Telephone Company will practically do away with telegraphing, and it is for that reason that the Western Union Company, headed by the far-sighted Jay Gould, is making as little improvement in the Western Union plant as possible. An expert in the employ of the Western Union Company said further that telegraphy, as a medium for rapid communication, had seen its best days, as the lines to Boston and other comparatively near-by points over which the long-distance wires are strung have for anything like pressing business completely crowded telegraphy out.

THE ELECTRIC LIGHT.

Tarrytown, Md.—Zollickoffer & Brother want a plant for a new flour mill.

Lexington, N. C.—J. L. Peacock is inquiring as to the cost of electric light plants for street lighting.

Oswego, N. Y.—Mr. M. E. Graves, who is already interested in electric lighting, will put in an electric road.

Woburn, Mass.—The Woburn Electric Light Company has put in a Thomson welding machine at its station.

Columbia, S. C.—The Congaree Gas and Electric Company will put in a Thomson-Houston incandescent plant.

Beaumont, Tex.—The Beaumont Ice, Light and Refrigerating Company will add an incandescent dynamo, engine, etc.

Louisville, Ky.—The Kentucky Union Railway Company, of Louisville, will put in a plant of 800 incandescents at Clay City.

La Grande, Ore.—The La Grande Edison Company has been formed by A. H. Kerry, W. H. McDonald and H. Asser, with a capital stock of $15,000.

The Hartman Electric Company, of Duluth, Minn., has been duly incorporated, and succeeds to the business of the old Duluth Electric Company.

Fayetteville, N. C.—The Egypt Coal Company, through its president, Mr. T. A. Henszey, denies the report that it has bought the local electric light and gas plants.

Sales in the West.—The Chicago branch of the Thomson-Houston Electric Company reports the sale during October of 932 arc lights, 2,500 direct incandescents and 2,900 alternating.

Arthur Hernandez Braza, Calle de Gurasio, numero 166, Habana, Cuba, reports installing quite a number of isolated incandescent and arc plants in sugar refineries and on plantations.

New Cumberland, W. Va.—The New Cumberland Light, Heat and Power Company has been formed by A. Haigh, R. E. Lindsay, H. McMahon and others, with a capital stock of $50,000.

Hackensack, N. J.—The electric light was turned on in Hackensack by the new Edison plant last week, all the streets being thus illuminated. The terms for private lighting have not yet been announced.

Frostburg, Md.—The Frostburg Electric Light and Milling Company have bought their dynamo and engine from the Westinghouse Company and are now in running order. Mr. H. B. Colborn is secretary of the company.

Bloomington, Ill.—The Citizen's Gaslight Company, of Bloomington, Ill., has decided to add electricity to its plant, and will spend $50,000 in establishing an electric system, which will be the third in operation in that city.

Savannah, Ga.—Frank E. Rebarer, Clerk of Council, Savannah, Ga., will receive bids until Nov. 25 for furnishing the entire plant necessary for supplying 300 arc lamps of 1,000 candle-power, or its equivalent (either wholly or partly) of incandescent lights.

South Braintree, Mass.—The Braintree Electric Light Company was organized last week. The company has voted to issue stock to the amount of $25,000. Arc and incandescent lights will be furnished for streets, stores, etc., and power for manufacturing purposes.

Rutherford, N. J.—The Westinghouse incandescent lighting plant, which was installed in this place recently, was put in operation last week, and has already met with such favor that the orders for lights exceed the capacity of the plant (1,000 lights), and the company have decided to double it.

Westinghouse Arc Apparatus.—The following orders for arc apparatus to be applied to central station lighting, are being filled: Williamsport, Pa., 250 lights; Pittsburgh, Pa., East End, increase, 175; Florence, Ala., 35; Evanston, Ill., 70; Baltimore, Md., 35; Philadelphia, Pa,, 105; Chico, Cal., 35; total, 705.

Newport, R. I.—The City Council has contracted with the Newport Illuminating Company for 75 Thomson-Houston arcs at 50 cents per night for three years. An ordinance has been adopted placing all electric wires and appurtenances in the city under the control of the chief engineer of the fire department.

Brockton, Mass.—The local *Enterprise*, of November 2, contains a very spicy correspondence between Messrs. S. F. Van Choate, C. H. Jenks and Luther Stieringer as to the claims made for the Van Choate incandescent system, for the manufacture of which it is proposed to locate a factory in Brockton.

Los Angeles, Cal.—Rhodes & Keese have put in a 100 light incandescent plant for the Palace Restaurant. The Thomson-Houston dynamo is run by an Otto gas engine of 15 h. p., and the result is a better light than could possibly be obtained with gas, while the cost is less than it would be with 75 gas jets burning direct from the street gas mains.

The Lafayette, Ind., Car Company has decided to install an electric lighting plant for the illumination of their extensive buildings and yards at Lafayette, Ind. The order was placed with the Heisler Electric Light Company of St. Louis, and prompt shipment required. The apparatus was shipped from St. Louis on the day following the receipt of the order.

Brooklyn, N. Y.—The Brooklyn Electric Light and Power Company, which has been trying in vain to get a franchise from the Aldermen, and whose officers were recently arrested for stringing wires on the elevated road, applied to Justin Cullen last week for an injunction. The Corporation Counsel opposed the motion on the ground that the application now before the Aldermen should be acted upon before the company was allowed to do business under it. Decision was reserved.

The Rawson & Root Lumber Company, of Michigan City, Ind., which has been operating a Heisler electric lighting plant for about a year, has contracted to furnish a large number of lights to the future manufacturers whose works are run in connection with the Northern Indiana State Prison. To carry out this contract an order has been placed with the Heisler Electric Light Company of St. Louis for one of their largest dynamos, with necessary lamps, sockets, etc. The new apparatus is to be in operation before the middle of November.

Westinghouse Central Stations.—The following orders for central station apparatus were received by the Westinghouse Electric Company during the month of October: Allegheny City, Pa. (city lighting), 3,000 lights; Havana, Cuba, increase, 3,000; Nebraska City, Neb., 750; Aberdeen, Wash., 750; Weeping Water, Neb., 500; San Angelo, Tex., 750; New York, N. Y., increase, 9,000; West Superior, Wis., 1,500; Bethlehem, Pa,. 500; Evanston, Ill., 750; Independence, Iowa, 750; Nanticoke, Pa., 750; East Albany, N. Y., 750; Florence, Ala., 500; Corning, Iowa, 500; Bay City, Mich., increase, 750; Sedalia, Mo., 750; Pittsburgh East End, increase, 3,000; Little Rock, Ark., increase, 750; Fulton, Mo., 750; Connellsville, Pa., 1,500; Flint, Mich., increase, 500; Anoka, Minn., 750; Canton, China, sold through San Francisco agency, 1,500: Newark, N. J., increase, 750. Total. 34,750, 16 c. p. lt. capacity.

The Hill Clutch Works, through their Eastern manager, Mr. Walter C. Wonham, 18 Cortlandt street, New York, report that they are overwhelmed with orders from all parts of the country, and have recently made large shipments of their well known friction clutches and power transmission machinery to Providence, R. I.; New York; Boston; Dolgeville, N. Y.; Jersey City, N.J.; Schenectady, N.Y.; Milford, Mass.; Springfield, Mass.; Brooklyn, N. Y.; Newburyport, Mass.; Troy, N. Y.; Quincy, Mass.; Clinton, Mass.; Philadelphia; Paterson, N. J.; Bangor, Me.; Petersburg, Va.; Catskill, N. Y.; Baldwinsville, N. Y.; Torrington, Ct.; Montpelier, Vt.; Wilmington, Del.; Buckland, Ct.; Fitchburg, Mass.; Hampton, S. C.; Lawrence, Mass.; Pittsburgh, Pa. They have also just made a second large shipment to Bilboa, Spain. Mr. Wonham further reports that their clutch trade is particularly brisk in New York, Brooklyn, Baltimore, Boston and Providence, and that orders are constantly coming in from large and small electric light companies for the Hill friction clutch pulleys and couplings to be used in electric light and high speed work, for which the Hill clutch is particularly adapted. The Hill Clutch Works, a short time ago, opened an engineering office at 146 Franklin street, Boston, Mass., where they will be glad at any time to give engineering advice to intending purchasers. This office is in charge of Mr. Louis J. Hirt, M. E.

APPLICATIONS OF POWER.

Berkeley, Cal.—Mr. E. B. Ridley has secured an electric light and power franchise.

Hutchison, Kan.—The street railway company will adopt electricity as motive power.

St. Louis, Mo.—The Missouri Railway Company will build an electric road to Tower Grove.

Sparrow's Point, Md.—The Pennsylvania Steel Company is putting in an electric freight road.

Nashville, N. C.—The West Nashville Improvement Company will build an electric road 3½ miles long.

Memphis, Tenn.—The Memphis & Raleigh Springs Railroad Company will operate a road nine miles long by electricity.

Atlanta, Ga.—The West Atlanta Electric Railroad Company will put in the Daft system. Mr. W. B. Miles is President of the company.

The Chicago Electric Railway Company has been formed by O. M. Brady, T. P. Hicks, C. F. Swigart and others, with a capital stock of $1,000,000.

West End, Boston.—The Thomson-Houston system has now replaced all others on the West End road in Boston, and is being rapidly extended over the whole network.

The Stillwater, Minn., Electric Railway Company made a trial trip on Oct. 30, on their line from the Union Depot to South Stillwater and return, a distance of eight miles.

Orange, N. J.—Mr. F. M. Eppley, president of the Orange, Crosstown & Bloomfield Railway, has, it is stated, placed a portion of the tracks at the disposal of Mr. Edison for experiments with electric railway work, on the underground conductor system.

PERSONALS.

Mr. C. P. Bruch is now associated with the Empire City Electric Company.

Mr. T. A. Edison has been elected an honorary member of the New York Chamber of Commerce.

Mr. E. C. Bradley, superintendent of telegraphs on the Pennsylvania lines west of Pittsburgh, has been inspecting a portion of the 52,000 miles of circuits under his control.

Mr. Edward H. Johnson, president of the Sprague Electric Railway and Motor Company, has just closed up his residence at Greenwich, Conn., for the season, and will spend the winter at 57 West 54th street, this city. Mr. Johnson and his daughter Edna still continue to ride at the head of the class at Durland's Riding Academy every Wednesday evening, as they have in winters past.

Mr. E. C. Kilbourne, the president of the Seattle, Wash., Electric Railway and Power Company, was a caller at THE ELECTRICAL WORLD offices last week. His Seattle road has 13 cars, and is now adding three more miles of track to the six in use. His new power station of brick has put in 400 h. p. generating capacity, part of which will be devoted to stationary motor work. The in-

vestment on the plant, etc., reaches $100,000. Mr. Kilbourne is manager also of the Green Lake Electric Railway Company, which is now putting in a Thomson-Houston road, 4½ miles long, with two motor cars and trailers, to be ready by Jan. 1, 1890.

BUSINESS NOTICES.

Warm Praise For Houston's Electrical Dictionary.—The following is from the well-known architectural paper, *Building:* "In preparing this dictionary the author has endeavored to collect all terms used by electrical writers, consulting not only the standard text works of the profession, but the periodical literature as well, and the result has been not alone a dictionary of terms, but a brief encyclopedia of electricity. In explaining terms and defining words, illustrations have been freely used where the meaning would thereby be more readily comprehended. The book contains over 2,500 words and phrases, their definition and explanation occupying, as circumstances demanded, anywhere from a few words or lines to several pages. Comprehending to a slight extent the magnitude and difficulties of the work undertaken and the value to electricians of a clearly-defined language, one recognizes, in a measure, the great and lasting service conferred on electrical science by Prof. Houston in the preparation of this important work. The dictionary, while valuable to the electrician, will be highly prized by the lay reader as well, and consequently should find a place on the shelves of every well-equipped library, and no one who aims to keep up with current scientific knowledge will be without it." The Cleveland *Plain Dealer* says: "It is a necessity to all who have anything to do with electrical matters, or who would intelligently read electrical literature."

Battery Cut-Out.—Attention is called to a simple device for disconnecting gas-lighting batteries if accidentally grounded. It is cheap, sensitive, never needs watching, and has no clockwork to be kept wound. Terms furnished by the Electric Supply Company, of Syracuse, N. Y.. No. 105 South Warren street.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS ISSUED NOV. 5, 1889.

414,191. Electrical Regulating Apparatus; Henry J. Conant, of Watertown, Mass. Application filed Feb. 6, 1889. The main current is made to traverse the helix of a solenoid, the core of which actuates a pole-changing switch. By means of this switch the current is directed in one direction or the other through an electromagnetic helix operating a magnetic clutch, which controls the reversing gear of a cone-pulley belt shifter, and the changes of current in the main circuit are through the agency of this combination of mechanism enabled to act upon their source.

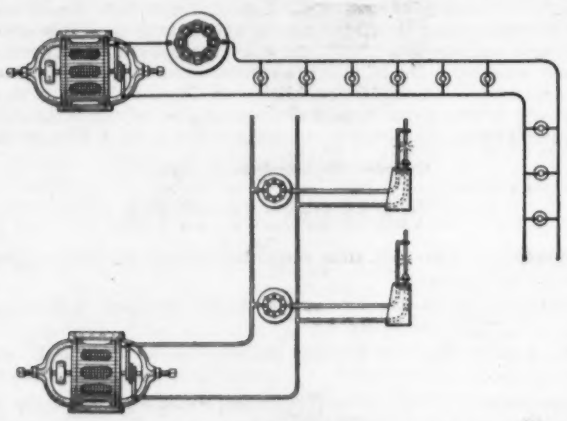
(1) 414,220. Electric Battery; (2) 414,317. Battery Carbon; (3) 414,318. Electric Battery; Charles A. Hussey, of New York, N. Y. Applications filed (1) Jan. 27, 1888; (2) and (3) Feb 9, 1889. (1) In a battery the combination, with positive and negative elements, of an exciting fluid, bichloride of mercury in electrical contact with one of the elements, and an absorbent material arranged in the bichloride of mercury. (2) A new article of manufacture, a battery carbon having the main portion burned to produce a granulated surface and render it porous, and having a shank and upper portion unburned. (3) In an electric battery the combination, with positive and negative elements, of powdered salts of bisulphate of mercury intervened between the positive and negative elements

414,245. Ring Armature for Electric Generators; Gustav Pfannkuche, of Hartford, Conn., Assignor to the Schuyler Electric Light Company, of same place. Application filed July 8, 1889. Patented in England June 29, 1884. The invention relates to the means of fixing between the coils saddle pieces of iron, filling the space between the coils at the outer periphery of the core, and having their two legs or sides wedge shaped and extending radially inward along the side of the armature between the coils.

414,266. Iron Cased Induction Coil for Alternating Current Transfer; Elihu Thomson, of Lynn, Mass., Assignor to the Thomson-Houston Electric Company, of Connecticut. Application filed February 12, 1887. An induction coil clad with iron inclosing both primary and secondary conductors, the primary and secondary coils together having a figure in cross-section which is substantially a square with sides of substantially equal length.

414,280. Mechanical Telephone; John C. Bates, of Aspen, Colo. Application filed Jan. 15, 1889. A telephone instrument having in rear of its diaphragm, and rotating at a fixed distance therefrom, a transverse bar adapted to receive the direct strain of the line wire and to partially or wholly relieve the diaphragm therefrom.

414,289. Switch for Electric Motor Trolleys; Will Christy, of Akron, O., Assignor of one-half to James Christy, Jr., of same place. Application filed Aug. 8, 1889. A switch for electric motor trolleys, consisting of a stem and divergent arms having a web uniting the arms, and a flange beneath the stem which unites with one of the arms, the other arm being provided with a dependent flange.



No. 414,541.—System of Electrical Distribution by Alternating Currents.

414,308. Burglar Alarm; Albert A. Goucher, of Euclid, Penn. Application filed July 19, 1889. Claim 3. In an electric indicator, the combination, with a suitable frame having numbers upon its face, of magnets secured thereto, an armature operated by the magnets, a shaft, journaled in the frame carrying a figure or object for covering the numbers upon one end, a lever or arm secured to its opposite end, a latch flexibly connected at its inner end, its outer end engaging the free end of the shaft lever and provided with connections which engage the free end of the armature, a vertically moving set rod adjacent to the shaft lever, and a cord, wire, or chain connecting the rod and lever for the purpose of causing the lever to engage the latch.

414,310. Electric Resistance Indicating Device; Charles Darwin Haskins, of Brooklyn, N. Y., and Charles E. Scribner, of Chicago, Ill., Assignors to the Western Electric Company, of Chicago, Ill. Application filed May 24, 1888. The invention consists of two equal differentially wound primary coils of an induction coil connected with a battery, in combination with a rheotome between the coils, a telephone or other current indicating instrument in the secondary coil of the induction coil, a rheostat in the grounded primary winding and a switch device for closing the other primary winding to the circuit including the resistance which is to be measured or compared with the known resistance of the rheostat.

414,327. Conduit for Electric Wires; John W. Richard and Joseph B. Hall, of Newark, N. J. Application filed Aug. 9, 1889. A hollow curb provided with stops extending up therefrom on that side nearest the walk, and having removable covers on the curb adapted to slide away from the walk and means therein for stringing wires.

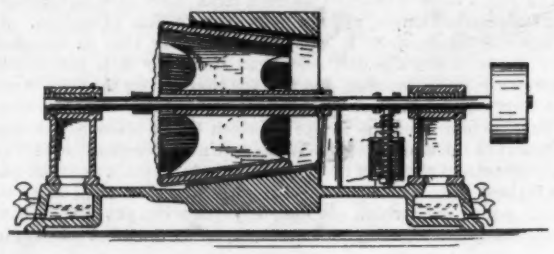
414,339. Time-Recording Device for Dynamo Electric Machines; Hollon C. Spaulding, of Boston, Mass. Application filed April 8, 1889. The combination, with a dynamo electric or electro-dynamic machine, of a time-indicating device, and a detent therefore controlled by the field of force of the machine. See page 306, this issue.

414,343. Tell-Tell Apparatus for Ship-Telegraphs; Walter Thomas Wright Thackeray, of Wandsworth, County of Surrey, and Isaac Hurn, of London, Eng., County of Middlesex. Application field Sept. 14, 1889. Claim 1.—The combination, with engine-room telegraphs or steering telegraphs, of an arm on an axis which is moved round when an order is given and passes over a series of contact plates and establishes a battery connection with the plate or plates on which it rests, and insulated wires from these contact plates to contact pins, which normally make contact with a plate in connection with a bell and battery, but which are so disposed as to be pressed back by the part or parts whose position has to be indicated, so that as the indicator is brought to point to any order on the dial a circuit or circuits are completed by the arm, and a bell in the circuit is rung and continues to ring until the lever or other moving part is moved into position to press back the contact pin or pins corresponding to the new position of the arm.

414,356. Lightning Arrester; Charles Wirt, of Orange, N. J. Application filed Aug. 15, 1889. A lightning arrester consisting of a multiplicity of electrically unconnected metal plates separated by slight insulating spaces. See illustration.

414,362. Splice for Wire; Albert Anderson, of Boston, Mass., Assignor to Chas. L. Edgar, trustee, of same place. Application filed July 8, 1889. The invention consists in a splice composed of a metal sleeve chambered to permit the end of the wire to pass or overlap stops in the sleeve, and a locking pin to enter the sleeve and pass between the overlapping wires and bend them into the enlarged chamber.

414,418. Electric Train Brake System; Harry Ward Leonard, of Chicago, Ill. Application filed Feb. 7, 1889. The combination of a train of cars with electrically-actuated brakes therefor, an electric generator thereon, a conductor which



No. 414,659.—Dynamo Electric Machine.

leads from one pole of the generator to the electromagnet controlling the brakes, two conductors leading from the other pole of such generator to the brakes and switches, one on each of the last-mentioned conductors, the switches controllable from different parts of the train, so that either may be used independently to operate the brakes. See illustration.

414,422. Galvanometer; Joseph E. Lockwood, of Detroit, Mich., Assignor of one-half to Charles P. Larned, of same place. Application filled Feb. 5, 1889. The combination, with an ammeter of terminals, connecting plug and connecting links, whereby the line may be closed and the instrument removed or adjusted without disturbing the terminals.

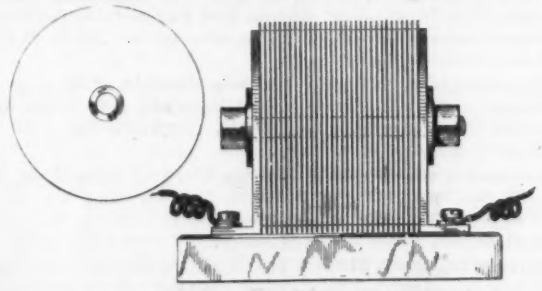
414,438. Secondary Battery; Harry Gould Osborn, of Chicago, Ill., Assignor of one-half to Eugene H. Hill, of same place. Application filled Aug. 23, 1889. In an electric battery, the combination, with the metal conductor plates of each electrode having lugs, of an insulator sleeve surrounding the lugs and provided with a shoulder which forms a support for the adjacent edge of the alternating plate of the opposing electrode and insulates the same from the lugs.

414,492. Quadruplex Telegraphy; Courtland P. Carr, of Chicago, Assignor of one-half to Fred. P. Marshall, of South Evanstown, Ill. Application filed Feb. 25, 1888. In a quadruplex telegraph the combination, with a main line, a neutral relay located therein, and its armature, of an electromagnet adjustable to and from the armature of the neutral relay, a condenser and condenser circuit in which the adjustable electromagnet is included.

414,541. System of Electrical Distribution by Alternating Currents. John Hopkinson, of Westminster, County of Middlesex, E., Assignor to the Westinghouse Electric Company of Pittsburgh, Pa. Application filed January 16, 1889. In carrying out the invention any suitable source of alternating electric currents is provided with a suitable system of circuits in which translating devices of any desired form may be included. Such translating devices may be connected in different branch circuits which require more or less difference of potential under the same or different circumstances. A counter electromotive force generator is therefore employed in any or all of such circuits for controlling the flow of current to any given translating device or group thereof independently of the others connected in circuit. The counter E. M. F. generator consists of a "kicking coil." See illustration.

414,583. Trolley for Electric Railways; Joseph M. Reams, of Meriden, Conn., Assignor to the Daft Electric Light Company, of New York. Application filed March 7, 1889. The combination, in a trolley constructed to run upon two parallel conductors of a roller upon an arm and a flexible insulating wire opposite the roller and adapted to bear against the other conductor.

414,595. Meter for Alternating Electric Currents; Oliver B. Schallenberger, of Rochester, Assignor to the Westinghouse Electric Company, of Pittsburgh, Pa. Application filed Sept. 8,



No. 414,356.—Lightning Arrester.

1888. The combination of an electric meter for alternating electric currents and a converter through which currents are supplied thereto, having a series primary coil and an assisting shunt primary coil, and a secondary coil connected with the meter.

414;609. Spring Switch for Overhead Electric Conductors; Charles J. Van Depoele, of Lynn, Mass. Application filed Jan. 24, 1889. A switch for suspended electric conductors, comprising a main conductor and a branch conductor having a laterally movable switch point, the extremity of which laps the under side of the main conductor.

414,612. Electric Bell; Edward Cox-Walker and Alan A. Campbell Swinton, of Westminster, County of Middlesex, Eng. Application filed March 11, 1889. Patented in England, June, 21, 1888; in France, Feb. 27, 1889, and in Belgium, March 5, 1889. In an electric bell, a metal frame to which are secured the following parts: Two bobbins with iron cores secured to an iron plate forming the yoke of the electromagnet and fixed to the frame, an armature carried by a forked arm adjustably attached to the frame, a striker attached to the armature and passing between the two bobbins of the electromagnet, and a bell mounted upon the bell frame.

414,624. Lightning Arrester; Charles Ira Young, of Princeton, N. J., Assignor to the Westinghouse Electric Company, Pittsburgh, Pa. Application filed Sept. 2, 1889. The combination, with a source of alternating electric currents and conductors leading therefrom, of a reactive coil connected between the conductors and a lightning arrester connected between the earth and an intermediate point in the length of the conductor of the reactive coil.

414,626. Induction Coil Apparatus; John A. Barrett, of Brooklyn, N. Y. Application filed Feb. 8, 1888. A generator or battery cell having on one end or face the usual terminals adapted for connection to an external circuit, and on the other end or face a conducting bar or stop whose ends span the same distance as the terminals and correspond with them in geometrical position, whereby the cell in one position can be actively included in an external circuit, and in another position can be open-circuited, while preserving the external circuit unbroken.

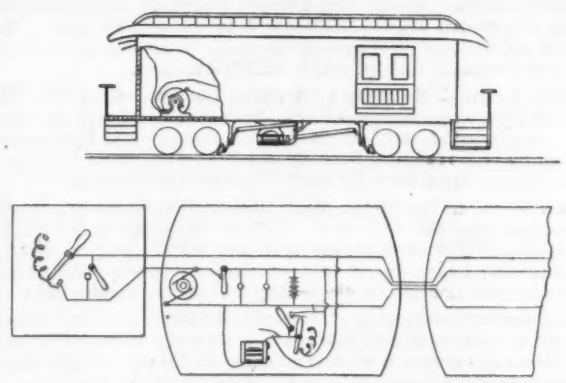
414,627. Electric Battery; John A. Barrett, of Brooklyn, N. Y. Application filed Feb. 8, 1888. In an electric battery, a cell having a cap or cover into which the battery wires are sealed, in combination with a cementing or sealing material applied to the surfaces of the joint between the cap or cover and cell.

414,637. Device for Converting Motion; George A. Goodson, of Minneapolis, Minn., Assignor to the Minneapolis Electro-Matrix Company, of same place. Application filed Feb. 7, 1889. Renewed Oct. 8, 1889. The combination, with a solenoid of a constantly reciprocating magnetic core, an independent movable armature within the magnetic field of the core, and a circuit controller in the electric circuit of the solenoid.

414,645. Electric Railway Signals; William P. Kookogey, of Brooklyn, N. Y., Assignor to the Kookogey Electric Company. Application filed March 15, 1887. The invention consists of electric circuits which are closed or completed through the medium of the locomotive or train, and when completed cause an electric signal light to be lighted at the entrance of the tunnel or cut, which causes other lights to be successively lighted and extinguished as the train moves through the tunnel or cut, or over the road to light its passage, and through which finally the signal light is extinguished when the train completes its travel over the guarded section.

414,659. Dynamo Electric Machine; Wm. Seafert, of Chicago, Ill., Assignor of one-fourth to Frank M. Staples, trustee, of same place. Application filed Sept. 10, 1888. In a dynamo-electric machine, the combination, with the armature of diminishing diameter from end to end of a field magnet or field magnets having pole pieces of corresponding shape, one of the elements being movable with respect to the other in the direction of the axis of rotation of the armature, whereby the lateral distance between the surfaces of the armature and pole pieces may be varied. See illustration.

414,668. Galvanic Belt; William Laughton, of No. 41 Rylston Road, County of Middlesex, Assignor to Francis Moreton, of London, Eng. Application filed Oct. 6, 1888. A galvanic belt for medical purposes, composed of a non-conducting flexible band or base having secured thereto a series of dissimilar metal plates in pairs separated from each other by absorbent threads acting as conductors of galvanism when damp with exhaled perspiration, the series being held from any contact with the body of the wearer by a raised strip or cushion of non-conductor and provided



No. 414,418.—Electric Train Brake System.

with terminal wires for conducting galvanic action to the body of the wearer.

PATENTS EXPIRED NOV. 12, 1889.

132,907. Improvement in Printing Telegraph Instruments; Elisha Gray, of Chicago, Ill. A line of telegraph instruments operated by one main battery placed at any point in the line, by means of a combination of circuits and electro-mechanical devices.

132,930. Improvement in Arrangement of Circuits and Apparatus for Duplex Telegraphing; Joseph B. Stearns, of Boston, Mass. In double transmitting apparatus, the extension of the local sending circuit and local receiving circuit from the main station to branch or secondary stations.

132,931. Improvement in Circuits and Apparatus for Duplex Telegraphy; Joseph B. Stearns, of Boston, Mass. This invention relates to apparatus for the simultaneous transmission of two signals from opposite ends of the same line wire, and consists in the method of enabling either main station at the end of the line to maintain correspondence with one or more way stations.

132,932. Improvement in Duplex Telegraph Instruments and Circuits Therefor; John B. Stearns, of Boston, Mass. Consists of the combination of the receiving instrument or relay with resistance coils in such a manner that when a current is transmitted from the home station it passes directly to the line without passing through the receiving instrument at that station, this instrument responding only to the currents transmitted from the distant station, which permits of the use of a chemical receiving instrument, if desired, in place of the electro-magnetic instrument generally used.

132,933. Improvement in Duplex Telegraph Apparatus; Joseph B. Stearns, of Boston, Mass. Consists in the combination, with the receiving magnet, of a device which, by mechanical means, prevents the magnet from responding to the signals transmitted from the home station, but does not prevent it from responding to signals from the distant station.

132,997. Improvement in Galvanic Batteries; Wm. J. Wilder, of Cleveland, O. The outer surface of a hollow zinc cylinder is coated with lacquer or other material that shall resist the action of the acid, leaving the inner surface free to the action of the acid.

133,019. Improvement in Electrical Printing-Machines; Thomas A. Edison, of Newark, N. J., Assignor to himself and George Harrington, of Washington, D. C. The type wheel and shaft are revolved by friction from the armature of an electro-motor placed upon the type wheel shaft.

Copies of the specifications and drawings complete of any of the patents mentioned in this record—or of any other patents issued since 1866—can be had for 25 cents. Give the date and number of patent desired, and address The W. J. Johnston Co. Ltd., Times Building, N. Y.